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EUROZONE MEMBERSHIP FOR CENTRAL AND EASTERN EUROPE
AN APPLICATION OF THE OPTIMUM CURRENCY AREA THEORY

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ABSTRACT

The accession of the former socialist countries of Central and Eastern Europe to the European Union has placed a legal obligation on them to relinquish their national currencies and adopt the euro. This dissertation applies the theory of optimum currency areas to evaluate the economic rationale of EMU membership for nine CEECs. OCA properties are embedded in a cost-benefit analytical framework and applied to the CEECs in order to comprehensively analyse the economic case for EMU membership. Due to evidence of the limited capacity for alternative adjustment channels to absorb the impact of asymmetric shocks, the cost side of the analysis focuses on the degree of business cycle correlation between the CEECs and the euro area. Applying the Hodrick-Prescott filter to quarterly real GDP data between 1995 and 2010, the tests find that despite considerable progress in convergence, the degree of correlation between the CEECs and the aggregate euro area business cycle is below what is observed among the existing EMU members. This indicates a substantial risk still exists that the ECB's monetary policy may be ill-configured to economic conditions in some CEECs. The benefit side of the analysis focuses on the degree of trade integration with the euro area. Hungary and the Czech Republic were found to be best-positioned of the CEECs to benefit from the elimination of transaction costs. The overall findings of the analysis suggest that EMU membership represents no additional cost to Estonia, Latvia, Lithuania and Bulgaria, and that they should experience a net benefit from participation in the eurozone. By fixing their exchange rates to the euro, these countries have already relinquished monetary policy autonomy as indicated by the Impossible Trinity principle. Croatia, Czech Republic, Hungary, Poland and Romania would be well-advised to wait until business cycles achieve closer correlation with the euro area core before proceeding with EMU accession. Three key policy recommendations are made to help minimise the costs of EMU participation. Structural reforms increasing the flexibility of labour markets are necessary to ensure unemployment does not bear the brunt of economic disturbances. Prudent fiscal policy is advised to ensure the sustainability of the public finances and to counteract the risk of economic overheating. Finally, tight financial sector supervision is encouraged to mitigate the risk that an anticipated fall in interest rates leads to asset price bubbles which could threaten the stability of the financial sector and the wider economy.

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INTRODUCTION

On 1 January 1999 eleven European Union Member States made the ultimate commitment to the process of European monetary integration by relinquishing their respective national currencies and adopting a single currency, the euro.¹ Marking the third, and final, stage of the European Economic and Monetary Union (EMU), from this date exchange rates between the eleven participating members were irrevocably fixed and sovereignty over national monetary policies transferred to a single monetary authority, the European Central Bank (ECB). By eliminating exchange rate uncertainty and transaction costs between participating members, policymakers expected that the adoption of the single currency would enhance microeconomic efficiency and growth through increased trade and heightened competition.² The single currency was also viewed as an opportunity to improve price stability and encourage convergence between the union's constituent countries and regions.³

The launch of the EMU was also a significant milestone within the broader process of European economic and political integration. Carefully mapped out in the 1992 Maastricht Treaty,⁴ the realisation of the EMU was preceded by fifty years of deepening economic and political integration and marked the end of over three decades of attempts to achieve

¹ Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain officially adopted the euro as their currency on 1 January 1999. Initially a unit of account, the euro currency was not introduced in cash form until 1 January 2002.

² These were the main benefits identified by the 1990 'One Market, One Money' report commissioned by the then European Commission President Jacques Delors to determine the likely economic effects of a move to a European Economic and Monetary Union.

³ See European Commission (1990, p.9).

⁴ Formally known as the Treaty of European Union, it was signed by Foreign and Finance Ministers on 7 February 1992 and ratified by all members by the end of 1993. With the exception of Denmark and the United Kingdom, which obtained certain opt-out clauses entitling them to decide their own monetary future, all remaining members committed to the adoption of the single currency.

monetary union in Europe.⁵ In that time, a number of arrangements attempting to limit exchange rate fluctuations between European currencies failed.⁶ Shortly after the official ban on capital controls from July 1990, there was a widely held view that a single currency was needed for the Single Market to exploit its full potential (Mongelli, 2008).

Two episodes of European Union enlargement, in May 2004 and January 2007, have included ten former socialist countries in the process of European economic and political integration.⁷ In signing the Accession Treaty to become full members of the European Union, all countries are faced with a legal obligation to relinquish their national currencies and adopt the euro.⁸ To date, three of the former socialist countries (Estonia, Slovenia and Slovakia) have fulfilled this obligation. The remaining seven (Bulgaria, Czech Republic, Hungary, Latvia, Lithuania, Poland and Romania) are legally obliged to create the conditions necessary to meet the convergence criteria set out in the Maastricht Treaty and adopt the euro as their official currency.⁹ However, while each country is legally required to create the conditions necessary to join the euro, there is no deadline to abrogate their derogation; the respective economic authorities retain the freedom to influence the pace of progress in their path towards full Eurozone membership (NBP, 2009).

⁵ The 1962 Marjolin Memorandum proposing an economic and monetary union for the members of the European Economic Community (EEC) marks the official starting point of monetary integration in Europe (Mongelli, 2008). In the intervening period, the 1970 Werner Report planned to realise an economic and monetary union in Europe by 1980.

⁶ Part of the European Monetary System (EMS), the Exchange Rate Mechanism (ERM) was initiated in 1979 to limit exchange rate variability between participating members. Existing until its replacement with ERM-II on 1 January 1999, the bands within which exchange rates were allowed to fluctuate around the European Currency Unit (ECU) came under increasing pressure following the ban on capital controls in 1990. In 1992 the UK was forced to abandon the ERM. After Italy followed suit, the bands were widened to +/-15% in March 1993 (Mongelli, 2008).

⁷ Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia joined the European Union on 1 May 2004 along with Cyprus and Malta. Bulgaria and Romania became full EU members on 1 January 2007.

⁸ As EU Member States, all acceding countries automatically participate in the third (i.e. definitive) stage of the Economic and Monetary Union with the status of participant with derogation. With the exception of Denmark and the United Kingdom, which are not legally required to adopt the euro, all remaining non-eurozone EU members have the status of EMU participant with derogation. Denied an opt-out, Sweden is classified as an EMU participant with derogation. However, reluctant to adopt the euro, Sweden reached a gentleman's agreement with the European authorities whereby it would be *de facto* treated in the same manner as Denmark (Baldwin and Wyplosz, 2009).

⁹ In accordance with Articles 104 and 121 of the Treaty establishing the European Community (TEC), the achievement of durable nominal and legal convergence is a formal condition for the adoption of the single currency and the abrogation of a country's derogation. In addition to the legal convergence criteria, there are five economic convergence criteria (more commonly known as the Maastricht criteria). These are as follows: (i) the inflation rate should be no more than 1.5% higher than the average of the three lowest inflation rates of the existing Member States; (ii) interest rates (of government bonds or comparable securities) should not exceed by more than 2% the average observed in the three lowest-inflation countries; (iii) countries must have participated in the ERM and not experienced a devaluation for at least two years before entrance to the union; (iv) the government's general deficit should not exceed 3% of GDP; and (v) the ratio of government debt to GDP should not exceed 60%, or the ratio must be diminishing and approaching the reference value at a satisfactory pace (ECB, 2010).

The main aim of this dissertation is to evaluate the economic rationale of EMU membership for the seven Central and Eastern European countries (CEECs) with derogation. Although each country is legally required to eventually transfer monetary policy sovereignty to the ECB, they have retained the freedom to decide when to do this. Two other CEECs will be included in this research. Estonia abrogated its derogation by becoming a full EMU member on 1 January 2011. As the empirical study employs data up to 31 December 2010, Estonia will be included in the research. Findings in the case of Estonia will provide a retrospective analysis of the economic justification for its accession. Additionally, Croatia completed accession negotiations with the EU and is expected to become an EU Member State on 1 July 2013.¹⁰ As Croatia will also be legally required to adopt the euro, an examination of the economic rationale for Croatian EMU membership is also important.¹¹

An evaluation of the economic rationale for EMU membership is warranted for a number of reasons. To the extent that independent monetary policy is useful as an instrument for maintaining internal and external balance in the economy, the relinquishment of sovereignty over the control of interest rates and money supply represents an economic cost to a country. As such, an assessment of the net welfare effects of EMU membership should be integral in the decision of when a country should join the euro. However, despite the critical significance of the choice of exchange rate regime to the welfare of a nation's economy, economic considerations play a minor role in the procedure for euro adoption.¹² In his assessment of the process of designing the institutions and rules which would govern the EMU, Wyplosz (2006) confirms that such was the urgency in drafting the details of the EMU, there was no time for any detailed economic analysis.¹³

In evaluating the economic rationale of full EMU membership for these countries, the results of the research will be useful in analysing whether the countries in question should prioritise efforts to adopt the euro, or whether they would benefit from postponing accession. Although the decision on the pace of progress towards EMU accession is ultimately a political one, an evaluation of the economic case for membership should be highly influential in guiding this decision. Economic crises in some peripheral eurozone Member States in 2010

¹⁰ Accession negotiations were completed in June 2011 (European Commission, 2011).

¹¹ All future EU countries will also be expected to join the EMU. See ECB (2008).

¹² Rather than ensuring a country stands to benefit from participation in EMU, the Maastricht criteria focus on minimising the risk of destabilising exchange rate volatilities and misalignments that had on numerous occasions disrupted the EMS (Mongelli, 2008).

¹³ Sensing an opportunity after the collapse of the Soviet Union and the successful adoption of the Single Act, the single currency project was given such urgency that academic research could not keep up with the speed of decisions being made (Wyplosz, 2006).

and 2011 underline the need to ensure that there is a strong economic case for EMU accession and that adopting the euro will produce net benefits for acceding countries.¹⁴

In order to achieve the aim of the dissertation, the analysis must be grounded in a strong theoretical framework. The theory of optimum currency areas (OCA) will provide the theoretical foundations for this research. Originating in the debate on the merits of fixed and floating exchange rate regimes, the theory proposes a number of economic characteristics (frequently referred to as OCA properties or OCA criteria) which should ideally be shared between regions when drawing the boundaries of an optimum currency area. In identifying the conditions necessary for countries to function well in a fixed exchange rate regime, the OCA theory provides a useful starting point for analysing the costs and benefits of monetary integration and forms the intellectual foundation for any discussion on currency unions (Horvath, 2003).

The main contribution of this research is, however, an empirical one. By operationalising the OCA theory in the context of European monetary integration with the Central and Eastern European countries (CEECs), the research will provide policy recommendations for the pace at which these countries should proceed along the path to euro adoption. Applying the theory to a set of countries for which the prospect of monetary integration is a very real and pertinent issue, the research will shed light on whether the CEECs in question should prioritise efforts to satisfy the Maastricht criteria and proceed with euro adoption, or whether they would benefit from postponing eurozone accession to a later date.

Unlike a number of studies which focus on just one of the OCA criteria, this research considers the wider OCA theory to provide an informed evaluation of the economic suitability of eurozone membership for the CEECs in question. By utilising the most recent data available to assess the situation as of 31 December 2010, this research also contributes to the empirical OCA literature by updating the findings of some previous comparable studies. The inclusion of data covering the recent financial crisis will add further value to the research by assessing whether the crisis has affected the economic rationale of EMU membership for the CEECs.

Before proceeding with the analysis, it is appropriate to first highlight some limitations of the research. The obligation to join the EMU at some point demonstrates in

¹⁴ In its annual report assessing the Czech Republic's economic alignment with the euro area, the Czech National Bank notes in 2010 that economic crises in the eurozone's periphery have consequences for ensuring the EMU accession will have real benefits for the Czech Republic (CNB, 2010).

itself that the composition of the EMU is not static. As new members join, the EMU changes and this may alter the balance of costs and benefits associated with membership as time progresses. In evaluating the rationale of EMU membership for the CEECs, the EMU is considered as it existed in December 2010 to simplify the analysis. This applies not only to the constituent members of the EMU, but also to the rules and institutions governing the EMU. Research conclusions will not extend to recommendations regarding the institutional and structural set-up of the EMU itself.

In the chapter which follows, the OCA theoretical literature will be examined in order to establish an analytical framework for evaluating the economic rationale of EMU membership for the CEECs. The chapter will begin by describing the context in which the CEECs are faced with a decision regarding their exchange rate arrangement. Developments in the analytical approach of theory since the identification of the OCA properties will be examined before an appropriate analytical framework for the research is identified.

Chapter two focuses on the empirical evidence generated in the OCA literature. In particular, attention will focus on studies which empirically apply the OCA theory to the case of monetary integration in Central and Eastern Europe. Close attention will be paid to the methods used and the conclusions with respect to the economic case of EMU membership for the CEECs.

The OCA theory will be operationalised in chapter three to evaluate the economic case for EMU membership for the CEECs at the focus of this study. Results from the empirical tests will be analysed and the economic rationale of EMU membership will be evaluated. Conclusions will be provided in chapter four.

CHAPTER ONE: THE OPTIMUM CURRENCY AREA THEORY

Since the identification of the optimum currency area concept by Mundell in his seminal 1961 paper ‘A Theory of Optimum Currency Areas’, the OCA theory has reshaped the debate on the choice of exchange rate regime for a given country (Horvath, 2003). By identifying the economic characteristics desirable for the smooth functioning of a single currency area, the theory provides a theoretical foundation for evaluating the appropriateness of monetary integration for a given country. It therefore offers an appropriate theoretical grounding for this research in evaluating the economic rationale of EMU membership for the CEECs in question.

The aim of this chapter is to define an analytical framework within which the economic rationale of eurozone membership for the CEECs in question can be assessed. Before examining the OCA theory in-depth, it is useful to first consider the context in which these countries are faced with the decision of choosing an exchange rate regime. In the section which follows, features of the Mundell-Fleming open economy model will be used to provide this context in the setting of European monetary integration.

1.1: The Impossible Trinity: Contextualising the Choice of Exchange Rate Regime

The Impossible Trinity principle (depicted in Figure 1 below) presents the relationship between the exchange rate regime, monetary policy sovereignty and capital mobility. Based on the Mundell-Fleming open economy model, it demonstrates the unviability of simultaneously maintaining free capital flows, a fixed exchange rate and a

sovereign monetary policy.¹⁵ Instead, it shows that it is feasible for a country's central bank to maintain just two of these three objectives represented at each vertex.

Observing the global trend towards greater international capital mobility, countries are increasingly being pushed towards the lower part of the graph (Frankel, 1999). Essentially, increased global capital mobility is whittling the trilemma down into a dilemma: a choice between monetary policy autonomy and a fixed exchange rate regime. It is within this context that the debate on the merits of fixed versus floating exchange rates can be viewed.

The depiction of the Impossibly Trinity principle can be somewhat misleading, however, as the options presented in it represent only two extreme possibilities in a spectrum of exchange rate arrangements. At one extreme, monetary union represents the ultimate commitment to a fixed exchange rate regime.¹⁶ At the other extreme, a pure floating arrangement, in which the central bank allows the forces of supply and demand determine the exchange rate by not interfering in the foreign exchange market, represents the most flexible arrangement possible. Frankel (1999, p.2) describes the fixed versus floating debate as an *"oversimplified dichotomy"*. In his view, intermediate exchange rate regimes are often more likely to be appropriate than the 'corner solutions' of free float and currency union. Frankel (1999, p.37) states: *"for many countries, regimes between the extremes of pure floating and rigid fixity will continue to be appropriate, the new conventional wisdom notwithstanding"*.

Frankel distinguishes seven intermediate exchange rate regimes between the two extremes (positioned at the bottom of Figure 1 in order of flexibility/rigidity¹⁷). These arrangements can be further grouped into three categories according to the International Monetary Fund's classification system: floating (free float and managed float); hard pegs (monetary union and currency board); and, in between the two, soft pegs (all other intermediate regimes).¹⁸

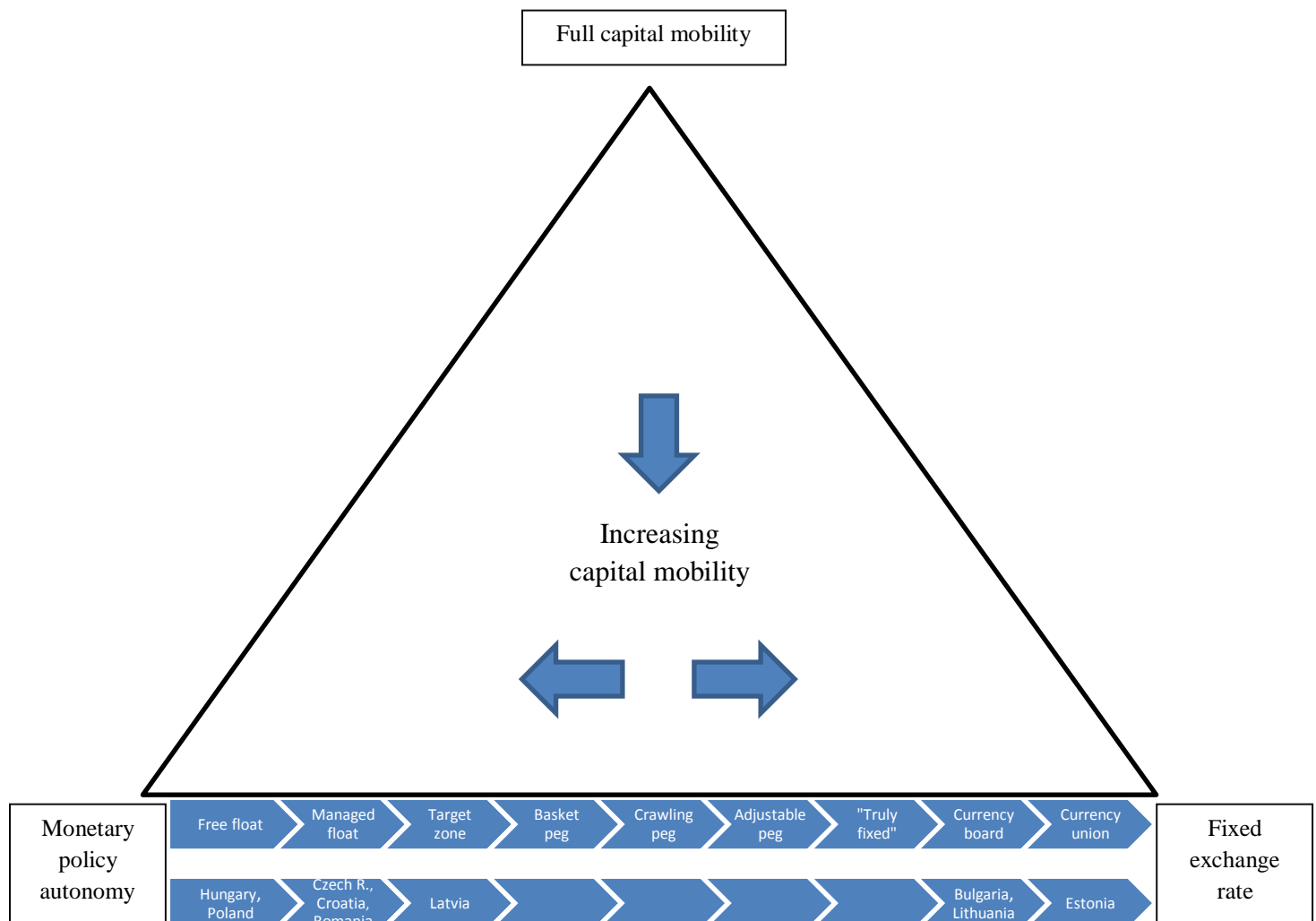
¹⁵ See Wyplosz (1997).

¹⁶ By fully abandoning the national currency in a monetary union, there is no greater commitment to a fixed exchange rate regime. However, the dissolution of the Soviet rouble and the Czechoslovak koruna in 1993 demonstrate that even a monetary union can become unfixed.

¹⁷ Beneath them, the current exchange rate regimes of the CEECs at the focus of this study correspond with the arrangement above. This classification is sourced from the official monetary policy strategies detailed in the European Central Bank's 2010 Annual Report (ECB, 2011) and from SEB's 2011 FX guide (SEB, 2011).

¹⁸ The IMF distinguishes a fourth, 'Residual', category for other exchange rate arrangements, such as frequently-changing policies, which do not correspond to the three main groupings. See Habermeire, *et al.* (2009) for detailed descriptions of the IMF exchange rate regime classifications.

Figure 1: The Impossible Trinity¹⁹



The new conventional wisdom to which Frankel refers is the so-called corner-solution hypothesis. Originally proposed by Eichengreen (1994), it suggests that the susceptibility of intermediate exchange rate regimes to speculative attacks in an environment of high international capital mobility will leave the corner solutions (i.e. floating or hard pegs) as the only viable options available to policymakers. Evidence from the literature supports Eichengreen's hypothesis. In his study of exchange rate regime options, Fischer (2001) confirms an observable trend away from intermediate exchange regimes, describing a 'hollowing out of the middle' in a bipolar direction towards free floating and hard pegs (monetary unions and currency boards). He explains the observed desertion of intermediate

¹⁹ Source: Frankel (1999). Amended by author.

exchange rate regimes by pointing out that intermediate, soft peg, arrangements have not proved viable for countries integrating into international capital markets. Fischer (2001) forecasts that the trend away from intermediate exchange rate regimes will continue and eventually lead to fewer independent national currencies.

Hence, not only is the liberalisation of international capital markets pushing countries towards the bottom part of the graph, but also out to the sides, towards the polar options of monetary union and free floating exchange rate arrangements. Despite Frankel's enthusiasm for intermediate exchange rate regimes, therefore, countries are likely to find such arrangements increasingly difficult to maintain and be forced towards either monetary union at one extreme, or a free floating arrangement at the other. Obstfeld and Rogoff (1995, p.74) concur: *"there is little, if any, comfortable middle ground between floating rates and the adoption of a common currency"*.

The Impossible Trinity principle and the corner solution hypothesis are relevant to the CEECs in this study and to the European monetary integration process more generally. The establishment of the EMU itself can be viewed as a corner solution to the challenges posed by the Impossible Trinity principle. Following the full liberalisation of capital movements within the EEC in July 1990, the Exchange Rate Mechanism (ERM), initiated in 1979 to limit exchange rate variability between participating members, came under increasing pressure. The unfeasibility of full capital mobility, independent monetary policies and limited exchange rate flexibility eventually led to a speculative attack which forced the UK to abandon the ERM on 16 September 1992.²⁰ After Italy was forced to follow suit, the ERM bands were widened to $\pm 15\%$ in March 1993. Indeed, Fischer (2001) points out that fresh thinking about exchange rate regimes and the belief in the non-robustness of intermediate exchange rate regimes for countries integrating into global capital markets partly derives from the manner in which the ERM was attacked.

Detailed in Table 1 below (and also in Figure 1), the choice of exchange rate regime by the Central and Eastern European countries at the focus of this study also reflects the trend observed by Fischer of the hollowing out of intermediate exchange rate regimes. At one extreme, Estonia has abandoned its national currency and entered monetary union with sixteen other European countries. Bulgaria and Lithuania, in employing a currency board arrangement with their currencies firmly fixed to the euro, also maintain a form of hard peg

²⁰ Commonly referred to as 'Black Wednesday'.

arrangement and, as a consequence, have effectively renounced sovereignty over monetary policy.

At the other extreme, both Poland and Hungary are classified as having free floating currencies, allowing the forces of supply and demand to decide on the value of their currencies relative to others. Meanwhile, Romania, Croatia and the Czech Republic are classified as having a managed floating exchange rate regime, allowing authorities to intervene in the foreign exchange market but without announcing a commitment to any particular exchange rate. By not committing to a fixed exchange rate, these four countries have effectively maintained monetary policy autonomy.

Table 1: CEEC Exchange Rate Regimes

CEEC	2010 GDP (€ millions) ²¹	Currency	Exchange Rate Regime ²²	Participation in ERM-II ²³
Estonia	14,501	Euro	EMU member. Currency board prior to 1 January 2011.	28/06/2004 – 31/12/2010
Latvia	17,971	Latvian lat	Managed floating exchange rate: €1 = LVL 0.702804 ± 1%	02/05/2005 - present
Lithuania	27,410	Lithuanian litas	Currency board arrangement: €1 = LTL 3.45280	28/06/2004 - present
Bulgaria	36,034	Bulgarian lev	Currency board arrangement: €1 = BGN 1.95583	N/A
Croatia	45,899	Croatian kuna	Managed floating exchange rate: no pre-announced band	N/A
Czech R.	98,446	Czech koruna	Managed floating exchange rate: no pre-announced band	N/A
Romania	121,941	Romanian leu	Managed floating exchange rate: no pre-announced band	N/A
Hungary	145,049	Hungarian forint	Free-floating exchange rate	N/A
Poland	354,316	Polish zloty	Free-floating exchange rate	N/A

²¹ Source: Eurostat Database.

²² Source: ECB (2011), SEB (2011).

²³ Source: ECB (2010).

Of the countries being studied here, only Latvia maintains a soft peg arrangement. By targeting a band of $\pm 1\%$ around a rate of 0.702804 lats to the euro, the authorities must intervene in the foreign exchange markets if the value of the lat threatens to move outside this band. A speculative attack on the currency in February 2007, at the beginning of the financial crisis, demonstrates most clearly the difficulties posed by intermediate exchange rate regimes in environments of high capital mobility.²⁴

Table 1 also contains details of CEECs' participation in the exchange rate mechanism (ERM-II). Currencies participating in ERM-II are allowed to float within a range of $\pm 15\%$ around a central rate to the euro and participation for two years without devaluation is one of the Maastricht criteria for euro adoption. Currently, Latvia and Lithuania are the only two CEECs participating in the mechanism. The remaining non-euro members in CEE have yet to enter the mechanism, meaning that they will not be allowed to adopt the euro for at least two years.²⁵

The evidence presented here has demonstrated that the realities of the Impossible Trinity principle are influencing the CEECs' choice of exchange rate regime. Increasing levels of capital mobility in Europe are forcing CEECs to choose between monetary policy autonomy and exchange rate flexibility. The vulnerability of intermediate exchange rate regimes is pushing the smaller CEECs towards hard peg options (currency board and monetary union) while larger CEECs are choosing flexible exchange rate regimes, confirming the trend predicted under the corner-solution hypothesis.²⁶ Now, however, all CEECs are faced with an obligation to abandon monetary policy autonomy and choose the monetary union corner solution as part of the wider process of European integration. In the sections which follow, the OCA theory will be examined to examine how the economic rationale for this move to the EMU can be evaluated.

²⁴ See Anderson (2007) for details of the turmoil in the Latvian economy.

²⁵ Buiter and Grafe (2002) argue that forcing prospective euro members to participate in 'ERM purgatory' is a pointless and costly exercise which exposes these countries to the unavoidable risk of speculative attacks.

²⁶ The relative size of the economies considered as measured by 2010 GDP in Table 1 illustrate that the smaller CEEC economies (the Baltics and Bulgaria) have opted for fixed exchange rate regimes while the larger CEECs have chosen to maintain exchange rate flexibility.

1.2 Early OCA Theory

The theory of optimum currency areas has its origins in the debate on the optimal exchange rate regime, and more specifically on the merits of fixed versus floating exchange rate regimes (Ishiyama, 1975). It was from this discussion that Mundell (1961) defined the optimum currency area problem as the determination of the geographic domain in which the goals of internal balance (low inflation and full employment) and external balance (sustainable balance of payments position) can most easily be achieved (Dellas and Tavlas, 2009, p.1123). A key feature of the theory is the identification of characteristics (frequently referred to as OCA properties, or OCA criteria), which, when shared by countries or regions, will facilitate the maintenance of internal and external balance in the absence of flexible exchange rates.

1.2.1: Mundell Vs. Friedman and the Fixed Vs. Floating Debate

Despite Mundell being accredited with the title of founding father of OCA theory, Cesarano (2006) points out that, at a theoretical level, he was presaged by Friedman in identifying the conditions necessary for the smooth functioning of a currency union. In his 1953 paper ‘The Case for Flexible Exchange Rates’, Friedman argued that if internal prices and wages in an economy were as flexible as exchange rates, there would be no difference in how the external balance of payments would be achieved. However, recognising the reality of sticky internal prices, and especially wages, Friedman highlights the adjustment problems created by a system of fixed exchange rates. In such a system, the rigidities posed by the stickiness of internal prices will result in unemployment as part of the adjustment process to an external deficit. To the extent that price rigidities inhibit the adjustment process and produce unemployment, Friedman argued that a flexible exchange rate is the more efficient method for adjusting to external change.²⁷

Mundell’s celebrated (1961) paper ‘A Theory of Optimum Currency Areas’ appears to have been partly aimed at contesting Friedman’s argument in favour of flexible exchange rate regimes (Cesarano, 2006). Mundell’s approach differed fundamentally from that of Friedman. Rather than focusing on identifying the conditions which necessitate flexible exchange rates, Mundell aimed to identify the economic characteristics which would

²⁷ See Friedman (1953, pp. 161 -167).

diminish the economic costs of relinquishing nominal exchange rate flexibility and nationally-tailored monetary policy. By identifying the optimum currency area problem as the determination of a geographical area within which external and internal balance can most easily be achieved, Mundell challenged the presumption that the borders of currency areas should coincide with those of sovereign states: *“Today, if the case for flexible exchange rates is a strong one, it is, in logic, a case for flexible exchange rates based on regional currencies, not on national ones. The optimum currency area is the region”* (Mundell, 1961, p.660).

Mundell uses the example of a permanent shift in demand to demonstrate the effects of an asymmetric shock to one region, West, which is in a currency union with another region, East. The example demonstrates the adjustment difficulties faced by both regions sharing the same currency in the absence of factor mobility. One major outcome of the paper is that factor mobility between countries or regions contemplating the formation of a monetary union is a necessary prerequisite if the costs of relinquishing monetary policy autonomy are to be minimised. Mundell (1961, p.664) concludes that *“if labour and capital are insufficiently mobile within a country then flexibility of the external price of the national currency cannot be expected to perform the stabilization function attributed to it, and one could expect varying rates of unemployment or inflation in the different regions”*.

In demonstrating that the characteristics of a region, or country, should be considered in determining the optimal exchange rate regime, Mundell had reshaped the debate on the pros and cons of fixed versus floating exchange rate regimes and laid the foundations for the theory of optimum currency areas. Prior to this, participants in the debate paid little attention to differences between countries, leaving the impression that the principles of the debate could be applied to all countries irrespective of their economic characteristics (Ishiyama, 1975; Kawai, 1992).

1.2.2: The Pioneering OCA Properties

Two OCA properties emerge from the Friedman-Mundell debate: flexibility of prices and wages, and mobility of factors of production. In a single currency area, these properties will facilitate adjustment to an economic shock, providing an alternative adjustment channel to the nominal exchange rate in the event of an asymmetric shock. The identification of the OCA problem by Mundell generated further contributions from academics interested in identifying the conditions necessary for the smooth functioning of a single currency area.

McKinnon (1963) introduces the openness of an economy to trade as an additional economic characteristic in the assessment of the optimality of a currency area. Distinguishing between the production of tradable and non-tradable goods in an economy, McKinnon proposes a model which examines the effect of changes in the relative prices of tradable and non-tradable goods on an economy's overall price level. The model demonstrates how, in a relatively-open economy, the transmission of changes in the international price of tradables to the general price index reduces the effectiveness of the nominal exchange rate as an adjustment instrument. The finding implies that relatively open economies should fix their exchange rates. It also follows that open economies that trade extensively with one another may find it optimal to form a monetary union. Another OCA property which can be derived from McKinnon's paper is the size of an economy. Given that small economies are likely to be relatively more open to trade, the transmission of changes in international prices is likely to reduce the usefulness of the nominal exchange rate and independent monetary policy as tools for economic adjustment.

Kenen (1969) turns attention to exploring the determinants of asymmetric shocks in identifying the desirable economic properties of a single currency area. He proposes that highly diversified economies are better-suited to the formation of a common currency area as they are more insulated from sector-specific shocks than are less-diversified economies. Furthermore, economies with similar production structures should encounter a smaller cost in forming a common currency area because sector-specific shocks are likely to affect them symmetrically.

Kenen (1969), too, develops the concept of the degree of fiscal integration as a property of optimum currency areas. He highlights how fiscal transfers between participants in a single currency area can serve to smooth the effects of asymmetric shocks by transferring funds to regions of high unemployment from regions unaffected by a shock. As such, a system of fiscal transfers can act as an alternative adjustment mechanism in the absence of flexible exchange rates, mobility of the factors of production or flexibility of prices and wages.

A number of other OCA properties have been proposed in the pioneering approach to OCA theory. Ingram (1962) highlights how financial market integration could cushion the effects of asymmetric shocks in a fixed exchange rate regime through capital flows. Financial market integration would allow for equilibrating capital movements between regions affected by idiosyncratic shocks. De Grauwe (2009) describes this as a private insurance scheme

against asymmetric shocks.²⁸ Similarities in inflation rates is an OCA property proposed by Fleming (1971), who notes that similarities in inflation rates over time help maintain stable terms of trade. Finally, some authors emphasise the political aspect of monetary integration in analysing the optimum currency area. Mintz (1970), for example, identifies political will as the most important condition in forming a monetary union. Table 2 below summarises the OCA properties that emerged from the pioneering approach to OCA theory.

Table 2: The Pioneering OCA Properties²⁹

	OCA Properties	Proponent
1.	Price and Wage Flexibility	Friedman (1953)
2.	Mobility of Factors of Production	Mundell (1961)
3.	Openness and Size of Economy	McKinnon (1963)
4.	Diversification of Production and Consumption	Kenen (1969)
5.	Fiscal Integration	Kenen (1969)
6.	Financial Market Integration	Ingram (1962)
7.	Political Integration	Mintz (1970)
8.	Similarities in Inflation Rates	Fleming (1971)

The early OCA theory provided an innovative approach to the discussion of the optimal exchange rate regime. However, the prohibitively difficult nature of its initial aim led to the low operational precision of the OCA theory (Horvath and Komárek, 2002). Additionally, the OCA properties were mired in inconsistencies and contradictions. For example, according to the theory, a small open economy should consider forming a currency union with a major trading partner. Yet, given that the production structures of small economies tend, by their nature, to be less diversified, the theory also suggests that that economy would find it optimal to operate a flexible exchange rate regime.³⁰

²⁸ Similarly, the public scheme against asymmetric shocks is the equivalent of fiscal transfers proposed in Kenen's (1969) fiscal integration OCA property. See De Grauwe (2009, pp. 10-13)

²⁹ See Mongelli (2005, pp. 608-611)

³⁰ This is one of a number of contradictions raised by the OCA theory identified by Dellas and Tavlas (2009, p. 1126).

Ishiyama (1975) was a prominent contributor in redefining the OCA theory. In his review of the early literature on optimum currency area theory, he highlights the limitations of the analytical framework in which authors attempted to single out a single crucial economic characteristic to determine the boundaries of an OCA. Recognising the inherent weaknesses in the OCA framework which had been emerging, Ishiyama proposes evaluating the costs and benefits of forming a currency union as an alternative approach to determining the domain of an OCA. According to Ishiyama's 'alternative approach', *"the optimum currency area is defined at the margin by the balance between the costs and benefits of having a common currency"* (Ishiyama, 1975, p.345).

Ishiyama's contribution helped provide more structure to the interpretation of OCA properties, which were used to address more systematically than before the relative costs and benefits of monetary integration (Mongelli, 2002). Despite developments in the analytical approach to the OCA theory, however, a mechanism did not exist for resolving the continued contradictions and inconsistencies among the OCA properties. Due to the persistent limitations of the analytical framework, OCA theory was consigned to 'intellectual limbo' for much of the 1970s and 1980s (Tavlas, 1993).

1.3: The "New" OCA Theory

A revival of interest in the subject did not occur until the late 1980s. Reinvigoration of the process of European monetary integration, developments in macroeconomic theory and advancements in econometric techniques all contributed to the re-found popularity of the subject (Tavlas, 1993; Mongelli, 2005). Renewed interest in OCA theory also saw a change of course in the fundamental purpose of the theory. Rather than seeking to draw the boundaries of optimal currency areas based on regional economic characteristics, the OCA properties were now used to provide a theoretical basis for discussing the costs and benefits of monetary integration.

Developments in macroeconomic theory led to a reassessment of the effective costs and benefits of sharing a single currency. A 'new' OCA theory began to emerge using the earlier approach as a point of departure, which stressed the criteria and methodology in choosing a single currency and enumerated the costs and benefits of a single currency (Tavlas, 1993). As a result of the reassessment, the balance of judgements shifted in favour of

monetary unions; greater emphasis is now placed on the benefits of monetary unions while fewer costs are seen to be generated from the adoption of a single currency (Mongelli, 2005).

1.3.1: Costs of Monetary Union

Since the debate on the pros and cons of fixed versus floating exchange rate regimes, the usefulness of monetary policy and a flexible exchange rate as adjustment tools in the event of an economic disturbance have been central to the OCA literature. Indeed, most of the OCA properties proposed in the early approach to OCA theory sought to identify characteristics which would either provide alternative channels for adjustment, or reduce the likelihood of an asymmetric shock occurring in the first place, i.e. seeking ways to diminish the costs associated with relinquishment of monetary policy autonomy. It is not surprising, then, that in the new cost-benefit approach to OCA theory, loss of monetary policy autonomy is viewed as the primary cost associated with the adoption of a single currency. The magnitude of the loss associated with the relinquishment of monetary policy autonomy has, however, changed since the 1970s.

Corden (1972) was one of the first to emphasise the primary cost associated with monetary union as the loss of control over national monetary policy to choose the desired mix between inflation and unemployment point along the long-run Phillips Curve. At that time, it was assumed that monetary authorities had the power to manipulate aggregate demand to offset supply and demand shocks; it was believed that it was possible to attain a desired point along the long-run Phillips curve in a permanent trade-off between inflation and unemployment.

Buiter (1999, p.49) refers to this belief that monetary policy can be used systematically and effectively to dampen the effect on the real economy of internal and external shocks as the *“fine tuning fallacy”*. Under what is referred to as the ‘monetarist critique’, the belief that the monetary authorities are free to choose a point along the long-run Phillips curve is now considered invalid (Tavlas, 1993). Rather, the long-run Phillips curve has been replaced with the Natural Rate of Unemployment (NRU), leaving policymakers free to choose only the rate of inflation in the long-run. Artis (1991, p.316) states: *“the displacement of the Phillips curve by the “natural rate of unemployment” as the place to start analysis is going to mean that the only benefit of floating exchange rates is the ability to*

choose a different rate of inflation from other countries - and we now see little reason to want to choose a positive rate of inflation”.

The monetarist critique of the long-run Phillips curve has highlighted the ineffectiveness of monetary policy in the long-run. Due to this revision, the primary cost associated with monetary union (the loss of independent monetary policy) has been scaled down in the new approach to OCA theory (Mongelli, 2005). It should be noted, however, that although the cost associated with the relinquishment of sovereign monetary policy has declined in the long-run, it is still considered to be useful in the adjustment process to short-term, temporary disturbances in the economy.

Considering the new approach of the OCA theory, Mongelli (2002, p.25) identifies a new OCA ‘meta property’ for evaluating the potential costs of participation in monetary union: *“The similarity of shocks, and policy responses to shocks, is almost a “catch all” OCA property, or “meta” property, capturing the interaction between several properties”.* The underlying intuition behind this proposal is that if shocks affecting participant members in a monetary union are similar, and the pace of adjustment to them are similar, then the single monetary policy governing them will be suitable for all members. The need for monetary policy autonomy will be reduced, diminishing the economic cost of relinquishing monetary policy sovereignty. As Bayoumi and Eichengreen (1993, p.194) state: *“Only if disturbances are distributed asymmetrically across countries will there be occasion for an asymmetric policy response and the constraints of monetary union may then be felt”.*

1.3.2: Benefits of Monetary Union

The reassessment of the OCA theory has tended to downplay the costs associated with monetary union, while the benefits arising from participation in a single currency area have received more attention. While the costs of a common currency are mostly associated with the macroeconomic management of the economy, many of the benefits are situated at the microeconomic level (De Grauwe, 2009).

The most obvious direct benefits from participation in a monetary union derive from the elimination of transaction costs and exchange rate uncertainty. Sharing a common currency, cross-border transactions within a monetary union will no longer require the exchange of one currency for another. The European Commission (1990, p.21) estimate the

savings from the elimination of transaction costs at between €13 billion and €19 billion per year, or 0.5% of the EEC GDP annually. It adds that this saving could reach 1% of GDP for Member States with small open economies and weak currencies which are not widely used internationally.

To the extent that transaction costs and exchange rate uncertainty represent impediments to trade and cross-border investment, their elimination can also be expected to have significant trade creation effects and promote long-term cross-border investments. Elimination of transaction costs also has the indirect effect of increasing price transparency between participating members, which can, in turn, increase competition throughout the monetary union. Combined with the effect of a reduction in exchange rate risk premia, these may lead to greater microeconomic efficiency with attendant effects on overall growth (European Commission, 1990).

In another reinterpretation of the costs and benefits associated within monetary union, one recent discussion has focused on the potential benefits of improved monetary policy credibility for countries forming a currency union. The discussion has its roots in the time-consistency literature developed by Kydland and Prescott (1977) and Barro and Gordon (1983), which highlight how economic agents follow optimal strategies in response to the strategies of the authorities. It points to a game between the government and the private sector in which economic agents understand that the policy makers have every reason to promise low inflation, while also having incentives to renege on that promise in the event that economic agents accept the assertion at face value. The upshot of this is that governments with a reputation for pursuing inflationary policies will find it extremely difficult to shed that reputation (Giavazzi and Pagano, 1988).

One way of shedding the high-inflation reputation and gaining low-inflation credibility is to renounce sovereignty of monetary policy completely by forming a monetary union (Giavazzi and Giovannini, 1989). However, the existence of an anchor country which recognises the costs of high inflation, has built a reputation for the maintenance of low inflation, and which will not alter its commitment to low inflation after the formation of the monetary union is vital if countries wish to gain low-inflation credibility in this way (Rogoff, 1985; Goodhart, 1990). In this way, monetary union offers the potential to import monetary policy credibility from an anchor country. This discussion also transforms the similarity of

inflation rates from a desirable property³¹ of prospective monetary union members to a desirable outcome for participants in monetary union (Tavlas, 1993).

1.4: Endogeneity of the OCA Properties

Until the late 1990s, the analytical framework developed in the OCA literature for evaluating the suitability of monetary union was static in nature. The OCA properties were analysed using backward-looking information to assess whether countries were suitable candidates for monetary union before integrating, i.e. *ex-ante*. However, the application of the Lucas Critique to the OCA theory since the late 1990s has again reshaped the debate on the optimality of single currency areas.³² As a result, much of the recent work in the OCA literature has focused on how monetary integration may change economic structure, possibly strengthening suitability for monetary union *ex-post* (Dellas and Tavlas, 2009, p.1132).

Initiated by Frankel and Rose's (1998) influential paper 'The Endogeneity of the Optimum Currency Area Criteria', this new insight into the dynamic nature of the OCA properties has profoundly altered the way in which the OCA properties are viewed. Frankel and Rose (1998, p.1011) state: "*The suitability of European countries for EMU cannot be judged on the basis of historical data since the structure of these economies is likely to change dramatically as a result of EMU*". Two relationships are central to their hypothesis of the endogeneity of the OCA properties.

The first relationship relates to the trade creation effects of monetary union: it is hypothesised that participation in a monetary union will encourage deeper trade integration among participating members. The second relationship relates to the effects of trade intensity on business cycle correlation: it is hypothesised that countries that trade intensely with one another will be subjected to similar economic shocks.

The theoretical foundations of the argument that the formation of a monetary union can boost trade intensity lie in the expectation that it reduces barriers to trade between members of a currency union through the elimination of transaction costs and exchange rate risk. However, up until 1998 there was considerable scepticism among economists as to the trade-boosting effect of a reduction in exchange rate variability (Frankel, 2008a). In addition

³¹ As suggested by Fleming (1971).

³² Lucas (1976) drew attention to the fact that changes in economic policy can lead to changes in economic structure, complicating the *ex-ante* interpretation of economic policies based on *ex-post* data.

to the lack of empirical evidence of the trade effects of monetary union, the theoretical backing for this scepticism lay in the belief that exporters and importers could use forwards and futures markets to hedge exchange rate uncertainty.³³

The question here, though, relates not only to the effects of exchange rate volatility on trade, but to the trade effects caused by the formation of a monetary union. After all, any proposed trade benefits resulting from the fixing of exchange rates may also be attained through the implementation of a currency board or fixed peg exchange rate regime. As has been mentioned in section 1.1, monetary union is the firmest possible commitment to a fixed exchange rate regime and is therefore less likely to be subject to a speculative attack. In the sense that membership of a monetary union precludes future devaluations, monetary unions can facilitate foreign direct investment (FDI) and the building of long-term relations above and beyond what a currency board might (De Grauwe and Mongelli, 2005). Furthermore, formation of a monetary union may signal a readiness to participate in broader economic integration including on issues regarding labour policy and property rights (Engel and Rogers, 2004).

A number of studies had already hinted at the potential trade integration effects of the adoption of a common currency at the time of Frankel and Rose's paper. McCallum (1995) demonstrates empirically that despite very low barriers to trade between the USA and Canada, trade between Canadian provinces is twenty-two times higher than trade between Canadian provinces and American states. Engel and Rogers (1996) support McCallum's findings, that despite the relative openness of the USA-Canada border, crossing it still has the effect on price dispersion of adding 1,780 miles to the distance between cities. From these findings, Frankel and Rose (1998) predict that even if a fraction of the difference between *international* and *intranational* trade is due to a common currency, EMU could have a substantial effect on intra-European trade.

The positive link between trade intensity and business cycle correlation is the second relationship at the centre of Frankel and Rose's hypothesis. Frankel and Rose (1998) hypothesise that the correlation of business cycles across countries depends on trade integration. If it is true, then, that increased trade integration as a result of monetary union leads to increased synchronisation in business cycles, the occurrence of asymmetric shocks to participating countries can be expected to decline after entering into monetary union. The significance of the hypothesis is that the reduced probability of asymmetric shocks (which

³³ Faults with the theoretical argument that exchange rate risk can be hedged lie in the presence of hedging costs and the lack of long-term hedging possibilities in most countries (Frankel, 2008a, p.3).

reduces the need for autonomous use of monetary policy) renders countries more suitable for participation in monetary union.

The theoretical underpinnings of the hypothesis that increased trade integration leads to increased business cycle correlation lie in the assumption that bilateral trade links foster the transmission of business cycles between countries. If these trade links intensify, countries in monetary union are more exposed to the business cycles of their trading partners which influence their own business cycle, leading to increased synchronisation. The hypothesis proposed by Frankel and Rose implicitly suggests that this trade is dominated by intra-industry trade (Artis, Fidrmuc and Scharler, 2008). If intra-industry trade dominates the increase in trade intensity between participating countries in a monetary union, a trade structure will emerge in which countries export and import similar categories of products. Shocks which are industry-specific can then be expected to have similar effects across countries (De Grauwe, 2009).

The second, and opposing, view on the link between trade integration and business cycle correlation is based on standard trade theory and has been pioneered by Paul Krugman. According to Krugman's view, increased trade integration as a result of the formation of currency union will lead to increased concentration of industrial activities as increased economies of scale induce specialisation. Krugman (1993) contrasts the regional distribution of auto production in the USA and Europe, illustrating how distribution of production in the USA, which is more highly integrated than the EU, is much more concentrated than in the Europe. Krugman postulates that the increased economies of scale which result in the decline in trading costs within a currency union will result in increased concentration of industrial activities in regions which possess an advantage over other regions. As a result, production structures should be expected to become less diversified. If increased concentration of industrial production materialises after the formation of a currency union, industry-specific shocks can be expected to be more country-specific, thus increasing incidence of idiosyncratic shocks which would necessitate autonomous monetary policy for economic stabilisation. Krugman's view implies that by becoming more specialised in their production structures, countries which form a monetary union may become less suitable for membership after forming the union than they were before.

Considering both sides of the argument, there is a theoretical presumption in favour of the Frankel and Rose hypothesis that economic integration will make asymmetric shocks between countries less likely (De Grauwe, 2009). De Grauwe (2009) highlights two weaknesses in Krugman's hypothesis. Firstly, he points out that while economic integration

can increase concentration of industrial activities, those economic clusters will be more likely to transgress national borders, reducing the likelihood of industry-specific shocks become country-specific. The second weakness in Krugmen's argument lies in the fact that it focuses on the manufacturing sector. The declining importance of manufacturing in industrialised countries and the growth of services (which are less prone to geographical concentration) suggest that the specialisation hypothesis may no longer be robust.³⁴

1.5: Applying the OCA Theory to the EMU Question

The aim set out at the beginning of this chapter was to define an analytical framework for evaluating the economic rationale of EMU membership for the CEECs at the centre of this study. Following a contextualisation of the nature of the exchange rate regime choice facing the CEECs, developments in the OCA theory were examined. Central to the OCA literature, the notion that a country's characteristics should determine its choice of exchange rate regime has reshaped the debate on the choice of exchange rate regime for a given country (Horvath, 2003). A number of OCA properties were identified in the early OCA literature which, when shared between countries, would facilitate the smooth functioning of a common currency area.

Inconsistencies and weaknesses in the early analytical framework, however, led to the low operational precision of the theory. Subsequent developments led to the emergence of a new OCA theory in which more structure was added to the interpretation of the OCA properties. The OCA theory has now developed to become the theoretical basis and standard point of departure for discussions on the costs and benefits of monetary integration for a given country (Bofinger, 1994; Horvath, 2003). Despite advancements in the theory, however, a comprehensive ready-to-use analytical framework for evaluating the economic rationale of monetary union membership does not exist.

In order to evaluate the economic rationale of EMU membership for the CEECs, the approach taken in this study will be to embed the OCA properties in a cost-benefit analytical framework. OCA properties will be empirically applied to the CEECs in order to evaluate the relative magnitude of the main costs and benefits associated with EMU membership

³⁴ An OECD (2000) report concludes that after years of increasing concentration of economic activities in the USA, activity has begun to become more dispersed. Clark and Van Wincoop (2001) also produce evidence that the degree of specialisation in the USA is decreasing.

identified in the literature. The results will determine the economic rationale of EMU membership for countries involved.

The main cost associated with monetary union membership identified in the literature is the loss of monetary policy autonomy. The Impossible Trinity principle was used earlier to demonstrate the incompatibility of maintaining monetary policy autonomy in monetary union in an environment of high capital mobility. Accordingly, accession to the EMU will entail the complete loss of monetary policy autonomy for CEECs; the national currency will cease to exist and control over all monetary policy instruments will be transferred to the European Central Bank. Controlling the monetary policy of the entire EMU, the ECB will set policy according to the economic conditions in the union as a whole. To the extent that nationally-tailored monetary policy was effective in adjusting the economy to shocks and restoring internal and external balance, loss of monetary policy autonomy represents an economic cost to a country.

It was demonstrated in section 1.1 that, by fixing their exchange rates to the euro, Estonia, Lithuania and Bulgaria have effectively renounced their monetary policy autonomy. Latvia has also severely restricted its ability to operate monetary policy independently of the euro area by allowing its currency to fluctuate within a very narrow band. With regard to the main cost associated with EMU membership, then, these countries have already accepted the main cost associated with participation in a monetary union.

The OCA literature has produced an OCA property which allows us to gauge to what extent the loss of monetary policy autonomy will be costly for a country. Considered the ‘meta’ or ‘catch-all property’ by Mongelli (2002), similarity of shocks and policy responses to those shocks offers a method for measuring the extent of this loss to an economy. For, if a country is subjected to the same shocks as other participating countries in a monetary union, and the speed with which the economies adjust to those shocks are similar, then the monetary policy set by the single central bank will suit that country’s economic conditions and the cost associated with the loss of nationally-tailored monetary policy will diminish. It is only in the event of an asymmetric shock that the need for an asymmetric policy response will arise.

In the event that shocks between participating members in a monetary union are dissimilar, economic imbalances may materialise. Without nationally-tailored monetary policy to resolve internal imbalances (unemployment or inflation) and external imbalances (unsustainable balance of payments position) alternative adjustment mechanisms may replace the role previously played by monetary policy. Three OCA properties can be identified

which, when present, may replace the role played by monetary policy as a mechanism for facilitating adjustment to asymmetric shocks.

The first two can be traced back to the contributions of Friedman (1953) and Mundell (1961): price and wage flexibility and mobility of factors of production. Friedman demonstrated that if wages and prices were as flexible as the exchange rate, there would be no difference in how the external balance of payments would be achieved. Mundell, meanwhile, showed how mobility of capital and labour could relieve internal imbalances in the event of an asymmetric shock by shifting factors of production from low-demand to high-demand regions.³⁵ If satisfied, price and wage flexibility and mobility of the factors of production can offer an alternative adjustment mechanism to monetary policy and reduce the costs of monetary union membership.

Finally, a fiscal transfer mechanism which acts to transfer funds from regions characterised by buoyant economies, with excess demand and threat of inflation, to depressed regions, with excessive unemployment, may act to smooth asymmetric shocks in the absence of other adjustment channels. Kenen (1969) proposed some degree of fiscal integration as desirable for participants in a monetary union. Such a system would mitigate the potential costs associated with monetary union.

Potential costs arising from monetary union need to be weighed up and compared with the expected benefits. Turning to the benefit side, direct savings from the eradication of transaction costs and exchange rate risk represent the most significant direct benefits to a country forming a monetary union. To the extent that transaction costs and exchange rate uncertainty represent barriers to trade and investment, their elimination may well have an attendant trade-boosting effect as well as potential gains from heightened competition and microeconomic efficiency leading to higher overall growth.

The extent to which an economy is set to benefit from the elimination of transaction costs and exchange rate risk can be gauged by another OCA property: openness to trade. Countries in which trade with foreign countries constitutes a larger share of the economy are set to benefit more from the elimination of transaction costs and exchange rate risk compared with countries which are relatively closed to trade. This indicates that the welfare gain per capita from monetary union is greater for countries which are more open to trade compared with countries which are relatively closed (De Grauwe, 2009). A more specific measure of the extent to which a country will benefit from these factors is its degree of trade integration

³⁵ Considering the costs of migration, however, labour mobility is a plausible alternative mechanism mainly for adjusting in the long-term to permanent shocks (Bayoumi and Eichengreen, 1993).

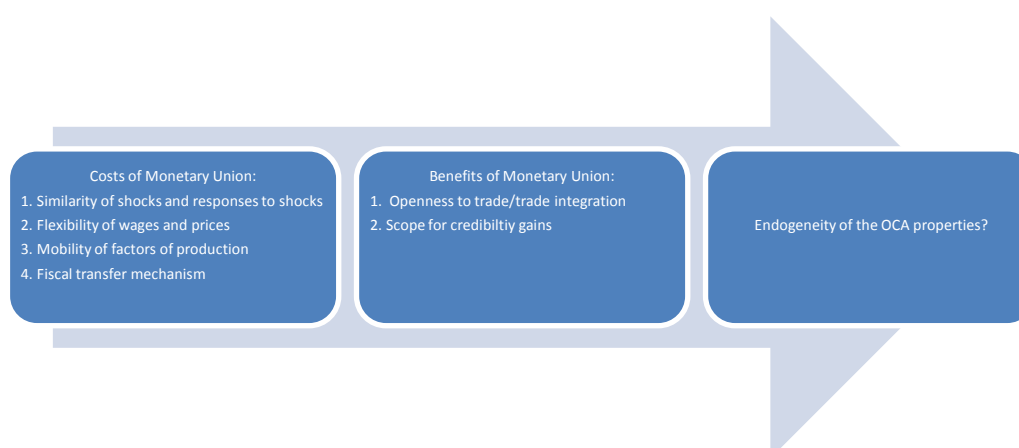
with other participating members in the monetary union as transaction costs and exchange rate risk will still apply to trade with countries outside the monetary union.

Openness of an economy to trade serves a dual purpose in this analysis. Not only does it gauge the extent to which a country will benefit from monetary union, but it is also an indicator of cost of losing monetary policy autonomy. McKinnon (1963) showed that the transmission of changes in international prices of tradables to the general price index reduces the effectiveness of the nominal exchange rate as an adjustment instrument for countries which are very open to trade. In this sense, openness to trade is a desirable property for potential monetary union participants both from a cost and a benefit viewpoint.

A second benefit which EMU membership may offer the CEECs is improved monetary policy credibility. In the reassessment of the OCA theory, it was shown that greater emphasis has been placed on the potential benefits of monetary union including the prospect of improved low-inflation credibility. This could also be a factor affecting the balance of judgements for countries considering monetary union.

A final consideration should be made in evaluating the economic rationale for EMU membership. The previous section drew attention to a recent strand of the OCA literature which hypothesises that the OCA properties may be endogenous in nature. In particular, the discussion focused on similarity of shocks and openness to trade as two OCA criteria which, if not fulfilled prior to monetary union membership, may be fulfilled after membership due to the structural changes which an economy is likely to undergo as a result of participating in the monetary union. If the theory can be relied upon, a case may be made in favour of EMU membership regardless of the current fulfilment of the OCA criteria. Figure 2 below graphically demonstrates the OCA properties to be examined in this analytical framework.

Figure 2: Analytical Framework



CHAPTER TWO: CEECS AND THE EMU: THE EMPIRICAL EVIDENCE

Sudden momentum towards EMU and advancements in econometric techniques contributed to the renewed interest in OCA theory in the early 1990s and prompted a swathe of empirical literature applying the theory to analyse the suitability of monetary integration for various countries. Having established a theoretical framework for analysing the economic rationale of EMU membership, the aim of this chapter is to examine evidence from the empirical literature applying the OCA properties to the CEECs under examination.

Three categories of empirical studies will be reviewed. Firstly, comprehensive in-depth analytical studies applying multiple OCA properties to analyse the suitability of EMU membership for the CEECS will be reviewed. The focus of attention here will be on how the studies approach the question of EMU membership for the CEECs and the evidence they use in arriving at their conclusions.

Secondly, literature focusing on the degree of business cycle correlation will be examined. Identified as the OCA meta property in the previous section, interest in empirically applying this OCA property has been particularly high. The purpose here is to determine whether business cycles of the CEECs are sufficiently correlated with the euro area for the costs associated with the loss of monetary policy autonomy to be minimised. Close attention will be paid to the methods used for measuring the degree of business cycle correlation in anticipation of an operationalisation of this criterion in the following chapter.

Finally, empirical evidence of the endogeneity theory based on the experience from EMU will be analysed. Having shown in the previous chapter the theoretical presumption in favour of the endogeneity theory, the aim here is to assess the actual extent to which endogeneity of the OCA properties have been detected in the EMU. Empirical evidence here will indicate how much the CEECs can depend on the endogeneity of the OCA properties in

their move towards the euro. The chapter will conclude with an analysis of the implications of the empirical evidence for the current research agenda.

2.1: Comprehensive Empirical Studies

Artis (2003) points out that among the countries for which EMU was an option, only the UK, Sweden and Finland have made any use of the OCA criteria at an official level. The use of the OCA properties at an official level in the CEECs for analysing the economic rationale of EMU membership appears to be similarly limited.³⁶ In what follows, comprehensive analytical reports from the IMF, Czech National Bank and the National Bank of Poland will be examined for evidence of how the OCA properties have been applied to the CEECs and what conclusions they come to regarding the economic rationale for EMU membership.

2.1.1: International Monetary Fund Report

Schadler, *et al.* (2005) provide an in-depth analysis of the issue of euro adoption for five Central European countries (Czech Republic, Hungary, Poland, Slovakia and Slovenia). The justification for excluding Estonia, Latvia and Lithuania from the study was based on the view that the Baltics do not face the same kind of challenges as the Central European countries (CECs) in their bid for euro adoption due to their ‘far closer policy links to the euro area’.³⁷ The authors’ framework for deciding on the suitability and timing of euro adoption is based on three steps: analysis of the long-term costs and benefits of euro adoption; scrutiny of the policy and institutional changes necessary for successful participation in the EMU; and assessment of the timing for credibly and efficiently fulfilling the Maastricht criteria.

The study draws heavily on the OCA literature in analysing the costs and benefits of euro adoption and the institutional and policy requirements for the successful participation of

³⁶ Apart from the official publications from the Czech National Bank and the National Bank of Poland reviewed here, Magyar Nemzeti Bank (2002), an occasional paper from the Hungarian Central Bank, appears to be the only other comprehensive application of the OCA theory at an official level among the CEECs examined. The study is not reviewed here in detail because the evidence used in the report is over nine years old. The report concludes that the euro area is at least as optimal a currency area for Hungary as it is for less developed euro area countries.

³⁷ That is, unlike the CECs, they have already relinquished or restricted monetary policy autonomy through their choice of fixed exchange rate regimes.

the CECs in EMU, using evidence from existing empirical studies in formulating conclusions. From the beginning, the authors identify a group of ‘non-core’ countries within the EMU (Greece, Portugal, Spain, Italy, Finland and Ireland) which had low levels of inflation, fiscal or business cycle convergence when joining. They are used as a benchmark in the analysis from which they draw lessons for the CEC countries preparing for adoption.

Regarding the potential benefits of euro adoption, trade creation and the attendant effects on income are the focus. Early estimates of the likely gains in terms of trade and growth are described as ‘startlingly large’.³⁸ However, even based on later lower estimates of the potential trade creation effects of euro membership, the authors believe the flexibility of the CEC economies means they can expect to gain more than average in terms of trade creation.³⁹ Concerning the translation of benefits into GDP growth, the authors consider as reasonable the Magyar Nemzeti Bank’s (2002) estimate that the euro will increase annual GDP growth by 0.6-0.8% over twenty years.⁴⁰

The cost of relinquishing monetary policy as a stabilisation tool in the event of an asymmetric shock is identified as the primary potential cost of euro adoption for the CECs: *“Susceptibility and adaptability to asymmetric shocks remain the gold standards for judging the appropriateness of membership in a currency union”* (Schadler, *et al.*, 2005, p.19).

With regard to the measurement of the susceptibility and adaptability to asymmetric shocks, the authors identify and review evidence of three methods: direct correlation of shocks;⁴¹ correlation of growth rates of economic activity;⁴² and, measures of the structural features of the economies which make them prone to asymmetric shocks or asymmetric responses to symmetric shocks. Based on their review of the empirical evidence, the authors find that the correlation of shocks between the CECs and the euro area is low, even compared with non-core euro area members, but observe that there is a trend of increasing correlation.

Regarding adaptability to asymmetric shocks after euro adoption, the authors predict that countries will depend primarily on wage and price flexibility and the ability to employ a counter-cyclical fiscal policy as the two key alternative adjustment tools. An examination of the responsiveness of the real unit labour costs to unemployment between 1995 and 2002

³⁸ Referring, in part, to the finding of Rose (2000) that membership of a currency union could triple trade with other currency union members.

³⁹ Faruquee (2004) finds a 10% increase in trade based on the first five years of EMU.

⁴⁰ This estimate is based on the assumption that income will increase by one-third of the increase in trade/GDP. See Frankel and Rose (2002) for a detailed examination of the expected effects of a common currency on trade and income.

⁴¹ This method involves the distinction between supply and demand shocks to an economy. Further details of this approach will be discussed in the following section.

⁴² Capturing both asymmetric shocks and asymmetric responses to symmetric shocks.

finds responsiveness in the CECs to be similar to that of the euro area.⁴³ Since no quantifiable standards exist, nominal wage flexibility (required to ensure unemployment does not shoulder the brunt of adverse shocks) is gauged indirectly through a number of indicators including employment protection legislation, the nature of the wage bargaining process and the presence of legally binding minimum wages.⁴⁴ It is concluded that CEC labour markets are at least as flexible as those in the euro area.

While wage and price flexibility will be particularly useful for adapting to asymmetric shocks in the medium- to long-term, the authors emphasise the importance of the use of counter-cyclical fiscal policies to smoothing the short-term effects of asymmetric shocks in currency unions. Preparedness to actively use fiscal policies to restrain demand in the event of credit booms is stressed as especially important in monetary union. The authors highlight how the 3% deficit limit imposed by the Stability and Growth Pact restricts the use of fiscal policies as a stabilisation mechanism to negative shocks. A prudent overall debt burden of no more than 40-50% of GDP is encouraged by the authors when entering the EMU to take into account the possibility of more volatile demand and output in comparison with the euro area average.

A prudent government debt burden is the first of five key requirements the authors deem necessary for the successful participation of the CECs in the EMU. The second relates to the other alternative adjustment mechanisms: it is strongly recommended that wage and price flexibility is protected and strengthened where necessary prior to EMU accession so as to avoid excessive unemployment and loss of competitiveness in the absence of flexible exchange rates.

The third requirement identified by the authors is the strong synchronisation of economic activity with the euro area before accession to the EMU to ensure the monetary policy of the ECB will be appropriate for the cyclical conditions in the CECs. Measuring both the susceptibility to asymmetric shocks and the asymmetric response to symmetric shocks, the level of synchronisation between the CECs and the euro area was found to vary. While Hungary and Slovenia were found to be as highly synchronised as some of the core and non-core euro area countries, synchronisation among all countries was observed to be increasing.

The importance of strong financial market supervision is identified as the fourth requirement for successful participation in the EMU. The authors expect rapid growth in

⁴³ The authors use annual data between 1995 and 2002 to calculate a wage curve equation following Blanchflower and Oswald (1994). See Schädler, *et al.* (2005, p.24) for more details.

⁴⁴ See Schädler, *et al.* (2005, p.23)

credit to the private sector as a result of an expected decline in interest rates to pose a severe risk to economic stability. Effective banking supervision and fiscal constraint are considered imperative to avoid the possibility of economic overheating and asset price bubbles in the absence of monetary policy autonomy. Finally, the fifth requirement is that the conversion rate agreed should be considered carefully before accession to the EMU as downward price and wage rigidities could make adjustment to an overvalued accession exchange rate costly in terms of unemployment and economic growth.

The authors conclude that according to historical data, the CECs examined are at least as well-suited to EMU membership as some of the non-core euro members. They expect that euro adoption will hasten real convergence with the euro area, although it is conceded that there exists a modest risk of increased economic volatility. On balance, it is concluded that euro adoption is likely to *“bestow substantial net gains on the CECs over the long term and make them stronger, more self-reliant members of the EU”* (Schadler, et al., 2005, p.10).

2.1.2: National Bank of Poland Report

In 2009 the National Bank of Poland (NBP, 2009) published a report with the aim of conducting an in-depth analysis of the costs and benefits associated with Poland’s adoption of the euro. While the analysis focuses on Poland’s position, the 392-page report makes frequent references and comparisons to other CEECs and existing euro area members. The analysis considers Poland’s degree of nominal and real convergence with the euro area before separately analysing the benefits and opportunities of euro adoption. The report also considers the costs and threats posed by euro adoption and the efficiency of shock accommodation mechanisms. Again, the report makes frequent references to the OCA theory and OCA properties.

With regards benefits, the authors identify the expected reduction in nominal interest rates as a result of a reduced exchange rate risk premium as the most important direct benefit to Poland from euro adoption. The authors estimate the quantity of this effect to be between 2.3% and 2.4% in the long-run.⁴⁵ Regarding long-term benefits, investment growth, trade intensification and increased competition effects as a result of euro adoption are viewed as most important. The attendant effects on GDP in the long-run as a result of replacing the

⁴⁵ The authors use the uncovered interest rate parity (UIP) method in their calculations.

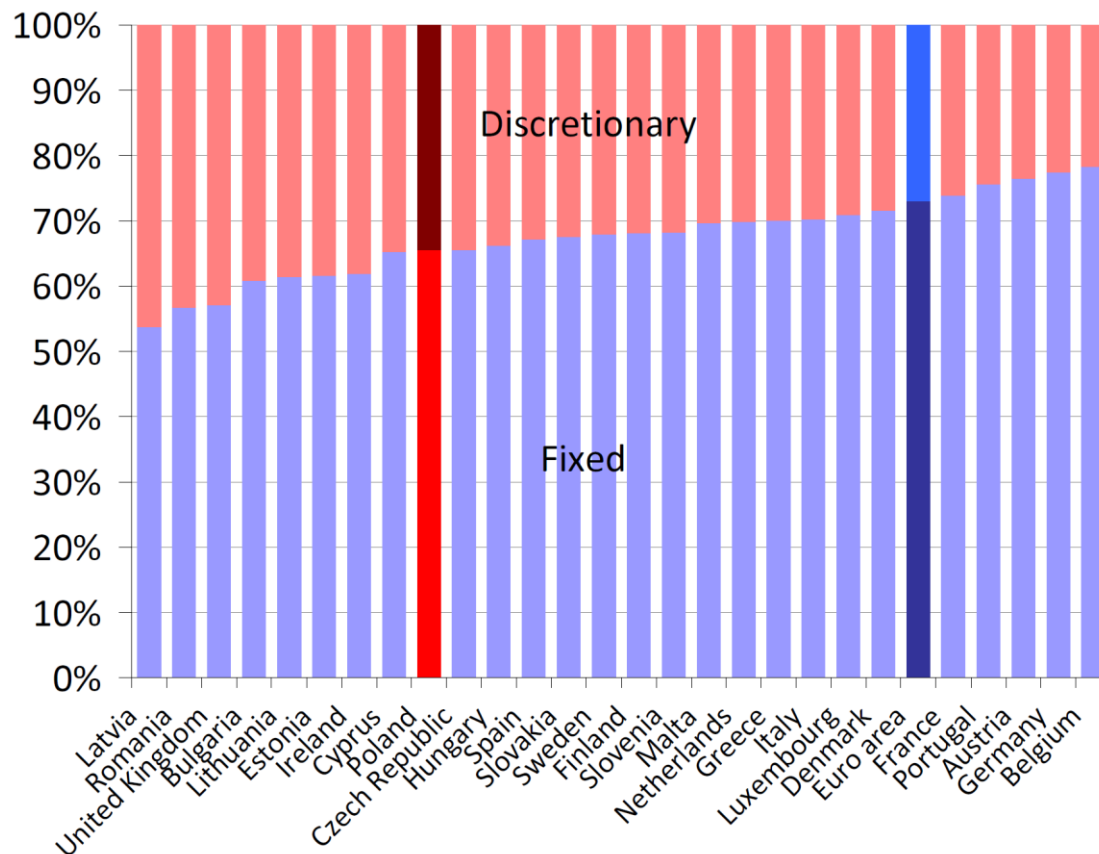
zloty with the euro are estimated at 7.5%, the majority of which will accrue in the decade following adoption. The authors translate this effect to 0.7% higher GDP growth per annum than if Poland were to remain outside the euro area. The authors warn, however, that Polish enterprises must be flexible enough to be able to absorb innovations and operate within an environment of heightened competition the full benefits are to be realised.

On the cost side, the report recognises the risk that the insufficient business cycle correlation between Poland and the euro area may result in an unsuitable ECB monetary policy for Polish economic conditions. It also considers the declining usefulness of independent monetary policy in an increasingly globalised economic environment. Reviewing the literature of business cycle correlation, the authors comment on the ambiguity of some of the results, but accept that the Polish business cycle appears to be more synchronised with the euro area than the average CEEC. Later, the report quantifies the estimated cost of the loss of monetary policy autonomy as equal to a 0.055% reduction in consumption, insignificant compared to the scale of the benefits estimated in the report.⁴⁶ As well as being a shock absorber, the report points out that the floating zloty exchange rate has also been a source of shocks. This finding has the effect of diminishing the cost associated with the loss of the flexible exchange rate instrument. Concerning medium-term threats, the report highlights the importance of the government and Polish central bank using the tools available to ensure the expected increase in lending as a result of expected lower interest rates does not adversely affect asset prices and overall financial stability.

The report emphasises the enhanced importance of three alternative stabilisation mechanisms in the absence of nationally-tailored monetary policy: fiscal, real exchange rate and financial channels. According to the report, a reduction in the structural fiscal deficit to at least 1% of GDP is what is required if automatic stabilisers are to operate freely. The report found the structural deficit in Poland to be 2.5% in 2007 with an expected negative trend observed. The report highlights the high importance of ensuring a budget structure which would not result in an uncontrolled increase in the deficit in the event of a downturn. In particular, a low proportion of fixed expenditure is desirable so as to ensure the efficiency of discretionary expenditure in reacting to shocks. Figure 3 below demonstrates the proportion of fixed and discretionary expenditure in European fiscal budgets in 2007. Broadly speaking, each of the eight CEECs perform well compared to the existing euro area members.

⁴⁶ Calculations assume an economically balanced situation and are based on simulations using a DSGE model (Dynamic stochastic general equilibrium model).

Figure 3: Structure of Budget Expenditure in the EU-27 (2007)⁴⁷



Influenced mainly by the efficient functioning of the markets for labour, goods and services, the real exchange rate (or competitiveness) channel is the second alternative adjustment channel emphasised by the report. The authors contrast the fortunes of countries deemed to have an efficient real exchange rate channel (Germany, Austria and Finland) with Portugal, deemed to have an inefficient real exchange rate channel, to emphasise the importance of flexible wages and prices. While the former group of countries maintained competitiveness in EMU by ensuring moderate wage and price increases, Portugal's faster growing prices and wages resulted in a loss of competitiveness which heralded economic stagnation in light of downward nominal rigidities.

The report notes difficulty in evaluating the flexibility of the Polish labour market. While it finds wages in Poland to be relatively flexible compared with other European countries, it also notes a weak relationship between wage levels and the condition of the labour market. With regards the overall functional mobility and flexibility of labour, the

⁴⁷ Source: NBP (2009, p.250).

report finds the labour market takes a long time to absorb shocks, blaming institutional rigidities including a high tax wedge, aspects of the system of social benefits and low expenditure on active labour market policies. The report encourages prospective euro members to take heed from the experience of countries such as Portugal to ensure as much as possible the reform of labour markets prior to EMU accession to ensure the efficient functioning of the real exchange rate channel.

Concerning the third mechanism identified in the report, the financial channel is judged to have a limited capacity to absorb economic disturbances. This is attributed to the relatively low degree of financial market development in Poland, although it is noted that euro adoption may accelerate financial market development and financial integration with the euro area, potentially increasing the efficiency of the financial channel as an absorption mechanism.

In its conclusion, the report predicts an asymmetry in the timing of costs and benefits arising from euro adoption. While the benefits already mentioned are expected to accrue over the medium- to long-term, there is a greater risk that the potential costs associated with euro adoption will materialise in the short-term. In order to avert these potential costs arising, the report emphasises the importance of implementing structural reforms to improve the efficiency of the alternative adjustment channels prior to euro adoption. Finally, in a supplement analysing the implications of the financial crisis on Poland's integration with the euro area, the report finds that the crisis does not affect the balance of costs and benefits concerning Poland's adoption of the euro. It is noted, however, that the crisis may seriously affect Poland's ability to meet the convergence criteria, particularly in relation to the fiscal criteria.

2.1.3: Czech National Bank Report

In accordance with the Czech Republic's Euro-area Accession Strategy, the Czech National Bank (CNB) is required to publish, on an annual basis, an updated analytical document assessing the Czech Republic's economic alignment with the euro area. Entitled 'Analyses of the Czech Republic's Current Economic Alignment with the Euro Area', the most recent such document was published in 2010 and compares the position of the Czech Republic with a number of euro area countries (Austria, Germany, Portugal, Slovakia and

Slovenia) and non-euro area countries (Hungary and Poland).⁴⁸ The theory of optimum currency areas provides the theoretical foundations for the analysis and is summarised briefly at the beginning of the document. The main empirical analysis is divided into two sections. The first concerns the structural and cyclical alignments of the Czech Republic and comparable countries with the euro area. The second focuses on adjustment mechanisms.

The report's authors find a significant rise in the correlation of both overall economic activity and of individual supply shocks between the Czech Republic and the euro area. Overall, correlation of quarterly output between 2002Q1 and 2010Q1 with the euro area are judged to be reasonably high.⁴⁹ However, they sound a strong note of caution that the sudden rise in correlation is as a result of the global economic downturn and suggest that the increase may not be indicative of future developments.

The high degree of openness of the Czech economy in terms of trade and ownership links with the euro area is one of the most positive indicators in favour of euro adoption for the Czech Republic, the report notes. The importance of this indicator is highlighted, both because it gauges the potential benefits in terms of the elimination of exchange rate risk and transaction costs in trade with other union members,⁵⁰ and because the integration of an economy to economic relations decreases the effectiveness of independent monetary policy and diminishes the probability of asymmetric shocks.⁵¹ The openness of the economy is measured by the value of exports and imports with the euro area as a percentage of GDP. Concerning exports, Czech Republic exports more as a percentage of GDP (almost 70%) than any other country studied. The other countries studied display a similar degree of openness, although Germany exports considerably less (about 42% of GDP). The situation regarding imports is broadly similar.

The second section of the report focuses on alternative adjustment mechanisms including fiscal policy, wage elasticity, labour market flexibility and the shock-absorbing capacity of the banking sector. These are all areas where the report's authors identify either long-term problems or recent adverse developments.

Low by European standards, Czech government debt, at around 40% in 2010, was found to be similar to other CEECs. However, the authors point out that the markedly

⁴⁸ The choice of comparison countries is not based on what the report deems to be countries performing well or poorly in the euro area, but based on those countries with strong trade links with the Czech Republic or those countries with similar levels of economic development to that of the Czech Republic.

⁴⁹ Calculations are based on quarter-on-quarter differences of real GDP. A method based on year-on-year differences and industrial production index data is also used. See CNB (2010, p.31) for more details.

⁵⁰ See CNB (2010, p.21).

⁵¹ See CNB (2010, p.46).

deteriorating public finance deficit could jeopardise this position and restrict the future ability of the government to employ fiscal policy as an alternative adjustment mechanism. Of the CEECs, only Hungary, with a government debt of almost 80%, could be compared with the western European countries studied which generally had higher public debts than the CEECs. The authors sound a note of caution that unsustainable public finances in monetary union, potentially creating the inability to finance future deficits and refinance maturing debt, may force countries into making drastic consolidation measures similar to that of Greece.

The authors measure real wage elasticity using a simple Philips curve and found evidence of low and decreasing elasticity of wages among the Czech Republic, Poland, Slovakia and Austria.⁵² Of all the countries studied, just Hungary was found to have significantly flexible real wages. Their findings suggest that wage elasticity cannot be relied upon as an alternative adjustment mechanism and that a low response of wages to labour demand may result in higher unemployment in most of the countries studied. Turning to labour market flexibility, the authors find considerable rigidities in the Czech labour market caused by the configuration of taxes and benefits and labour legislation which lead to low incentives to work among part of the population.

Although the annual CNB reports provide in-depth analyses and examinations of the various indicators it considers important in anticipation of euro adoption, they fall short of combining their findings to provide a conclusive view as to whether any of the countries studied should pursue with euro adoption or postpone. In its 2010 report, however, the CNB pays special attention to the fiscal crises in the euro area and their implications for euro adoption in the Czech Republic. It notes (p.18): *“it will be necessary to consider whether the area we are to enter is in a suitable condition (not only economically, but also institutionally and politically) to ensure that euro adoption will be of real benefit to the Czech Republic”*.

2.2: Business Cycle Correlation between the CEECs and the Euro Area

Following the revival of interest in OCA theory in the 1990s, a second wave of interest in OCA analyses was generated when it became clear that the CEECs would be obliged to participate in the EMU. Identified as the ‘catch-all’ OCA property in chapter one, similarity of shocks and policy responses to those shocks has featured prominently in the

⁵² See CNB (2010, p.77).

empirical literature for assessing the potential costs of monetary union. For, if countries are subjected to similar shocks, and adjust at a similar pace to those shocks, then the single monetary policy should be well-configured to the economic conditions of participating members. Only in the event of an asymmetric shock, or an asymmetric response to a symmetric shock, will an asymmetric policy response be necessitated and the constraints of monetary union felt.

The empirical literature has operationalised this OCA property by examining the degree of business cycle correlation between countries contemplating participation in a monetary union. The announcement that the CEECs would be required to join the EMU led to an explosion in the numbers of studies analysing the degree of business cycle correlation between the CEECs and the euro area (Fidrmuc and Korhonen, 2006). In this section, the various methodological approaches and results will be examined from the business cycle correlation literature with a focus on studies examining the degree of correlation between the CEECs and the euro area.

2.2.1: Econometric Approaches

A common consensus has yet to emerge in the literature on the most appropriate method to empirically examine business cycle correlation between countries. Three distinct methodologies can be identified in the literature which has developed to examine the correlation of euro area and CEEC business cycles (Ben Arfa, 2009).

In the first category, a simple correlation of an indicator of output (most often GDP or industrial production) and inflation are tested. Although examinations using simple correlations prevailed in the early research of business cycle synchronisation, its shortcomings mean that it is no longer a prominent feature of the current research agenda (Fidrmuc and Korhonen, 2006). Despite this, a number of papers employing more advanced methods frequently begin with an analysis of the raw data including simple correlations.⁵³ Caution is needed in the interpretation of such tests, however, as the simple correlation of output growth and inflation data does not necessarily translate into synchronisation of business cycle (Mikek, 2009).

⁵³ See for example Fidrmuc and Korhonen (2004), Horvath and Rátfai (2004), Mikek (2009).

In the second approach identified, studies employ a technique in which time-series data for an indicator of aggregate output is de-trended to extract the cyclical component from the trend.⁵⁴ The cyclical component is then tested for correlation between countries and analysed from the perspective of the international transmission of business cycles (Fidrmuc and Korhonen, 2006). If the cyclical component of two countries' aggregate output is highly correlated, incidence of an asymmetric shock is less likely. If their cyclical components were found to be uncorrelated, there is a strong likelihood that their economies will be subject to asymmetric shocks; a common monetary policy could create difficulties for both economies.

The Hodrick-Prescott (HP) filter and the Band-Pass (BP) filter are the two most popular filters in business cycle correlation literature (Darvas and Szapáry, 2008).⁵⁵ Although there is no consensus on which is the most effective, the choice of filter can have a significant impact on the results. In his examination of a set of real US macroeconomic time series, Canova (1998) demonstrates the variation of results produced by a number of de-trending filters, finding that both quantitatively and qualitatively stylized facts of the US business cycles studied vary widely across de-trending methods.⁵⁶ Having considered these findings, De Haan, Inklaar and Jong-A-Pin (2008) conclude that despite the extraction of different types of information by the filters, the findings are similar when comparing the information across countries.

The correlation of supply and demand shocks between countries is central to the final approach reviewed here. Studies following this approach employ a technique developed by Blanchard and Quah (1989) to recover underlying supply and demand shocks using time-series output and inflation data. The technique was first operationalised in an OCA context by Bayoumi and Eichengreen (1993).

At the centre of this approach is the distinction between the effects of supply and demand shocks on an economy. Demand and supply shocks can be recovered with the restriction that demand shocks have no impact on output in the long-term. Conversely, supply shocks do have a long-term impact on output. Applying this restriction in a structural vector autoregression (SVAR), it is possible to identify a country's supply and demand shocks. The

⁵⁴ Industrial production and components of GDP are also examined in some cases. For example, Darvas and Szapáry (2008) examine GDP, private consumption, investments, exports, imports, industrial production and services in their study.

⁵⁵ Further details on the functioning of these filters will be discussed in chapter three.

⁵⁶ The author examines seven univariate (Hodrick- Prescott (HP), Beveridge-Nelson (BN), Linear (LT), Segmented (SEGM), First-Order Differencing (FOD), Unobservable Components (UC), Frequency Domain Masking (FD)) and three multivariate (Common deterministic trend (MLT), One-dimensional index (MINDEX) and Cointegration (COIN)) detrending techniques for seasonally adjusted data over the sample 1955-1986.

incidence of supply and demand shocks can then be tested for correlation between countries or regions.⁵⁷

2.2.2: Empirical Evidence from the CEECs

Fidrmuc and Korhonen (2006) provide a thorough and valuable analysis of thirty-five identified publications which focus on the degree of business cycle correlation between the CEECs and the euro area published up to 2005. The authors note the broad cross-country focus as a decisive feature of the literature, with studies often incorporating at least eight CEECs. Of them, they point out that Bulgaria and Romania have received by far the least attention among the studies reviewed. The fact that few contributions to the research have come from CEEC central banks is highlighted by the authors.

The authors identify significant data issues in the studies. The short period for which data are available and the quality of data available for the CEECs in particular in the early 1990s calls the reliability of earlier empirical studies into question.⁵⁸ The transformational recession experienced by the majority of CEECs following the collapse of the USSR compounds this problem and makes interpretation of pre-1995 output shocks problematic as they are associated with losses as a result of a change in economic system. For this reason, Fidrmuc and Korhonen (2006) exclude any studies utilising pre-1995 data in their meta-analysis of the business cycle correlation literature.

Although two major categories of papers on business cycle correlation between the CEECs and the euro area are identified in the study (papers using a de-trended indicator of aggregate output, and papers using structural VARs), the SVAR method is judged to dominate the research agenda. The range of methodologies and sample periods used are found, however, to cause a lack of consensus as to the actual degree of business cycle correlation between the CEECs and the euro area.

The authors find that overall, the Hungarian business cycle is found to be the most closely-correlated with the euro area of all the CEECs. Poland and Slovenia are also found to have relatively highly-synchronised business cycles with the euro area. Indeed, the level of

⁵⁷ Bayoumi and Eichengreen (1993) also designate the over-identifying restriction that the accumulated effect of supply shocks on prices is negative while the accumulated effect of demand shocks on prices is positive. This is not employed in the SVAR model itself, but is useful as a method of testing the consistency of the results.

⁵⁸ See, also, Fidrmuc and Korhonen (2003).

synchronisation of all three countries is found to exceed that of euro peripheral countries Greece, Portugal and Ireland in the majority of cases. Lithuania is the only country found to be negatively correlated with the euro area on average.

Another feature of the literature reviewed by the authors is the frequent inclusion of at least one of the smaller peripheral euro area countries. According to the authors, these small peripheral euro member countries can be used as a gauge against which CEEC countries can be compared; if the level of correlation exceeds that of the EMU periphery, the new EU member may have achieved sufficient synchronisation so as to be deemed as having fulfilled this OCA: *“These results imply that, even though the degree of correlation in the new member countries is not perfect, they could still be expected to manage reasonably well within the monetary union and be at least on par with Greece, Ireland or Portugal”* (Fidrmuc and Korhonen, 2006, p.530).

In one of the more recent empirical analyses of business cycle correlation in the enlarged EU, Darvas and Szapáry (2008) are highly critical of the popularity of the SVAR method employed to examine the correlation of demand and supply shocks. Two empirical issues are highlighted. Firstly, the long-run restriction applied in the SVAR model to recover supply and demand shocks from output and inflation data are deemed not make sense in the short period for which data is available for the CEECs. Secondly, identifying supply and demand shocks using inflation data is judged to be problematic in CEECs due to the changes in relative prices following trade and price liberalisation in the 1990s.

Because of the deficiencies identified in the SVAR model, Darvas and Szapáry (2008) examine business cycle correlation in the enlarged EU using de-trended (using both the Hodrick-Prescott and Band-Pass filters) time-series data of GDP, private consumption, investments, exports, imports, industrial production and services. Seasonally adjusted quarterly data from eight CEECs⁵⁹, ten EMU members⁶⁰ and eight other countries⁶¹ for four non-overlapping five-year periods between 1983 and 2002 are studied⁶². Synchronisation of the business cycles of the countries listed with the business cycle of the euro area⁶³ is tested.⁶⁴

⁵⁹ Estonia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia.

⁶⁰ Austria, Belgium, France, Finland, Germany, Ireland, Italy, the Netherlands, Spain and Portugal.

⁶¹ Denmark, Sweden, United Kingdom, Norway, Switzerland, United States, Japan and Russia.

⁶² Data for some countries, most notably the CEECs, was not available for the entire period under consideration.

⁶³ The authors use two measures of euro area economic activity: euro area aggregate economic activity calculated by the ECB, and an aggregate of five countries (France, Germany, Italy, Austria and the Netherlands) calculated by the authors.

⁶⁴ For robustness, the authors use five measures to examine synchronisation: contemporaneous unconditional correlation; lead/lag for which unconditional correlation is largest; volatility of cycles; persistence of series; and impulse response.

The main findings of the study are that, by 2002, the synchronisation of GDP, industrial production and services of Hungary, Poland and Slovenia had increased dramatically to approach the levels of the EMU core and exceed the levels of some EMU periphery countries. The output of Slovakia and the Czech Republic were found to become less synchronised from 1993 to 2002. The authors suggest that the currency crises in the two countries (in 1997 and 1998), and the recession which followed, may be the reasons for this finding. Finally, the three Baltic countries are found not to be synchronised with the euro area in either period examined and no trend towards increased correlation is observed. The countries' synchronisation with the Russian business cycle between 1993 and 1997, the impact of the 1998 Russian crisis, and the countries' close trade links with non-EMU Nordic countries are put forward as possible explanations for this finding.

Mikek (2009) conducts one of the most recent studies employing the SVAR methodology developed by Blanchard and Quah (1989). The author uses quarterly data from 1995Q1 to 2005Q4⁶⁵ to study business cycle synchronisation between eight CEECs⁶⁶ and the three largest 'old' EMU countries⁶⁷. Seasonally adjusted data for the three 'old' EMU countries were gathered directly from the IMF's International Financial Statistics database, while data for the eight CEECs were seasonally adjusted by the author using the US Census Bureau's X12 seasonal adjustment procedure. Two sub-periods were studied to detect any change in the level of synchronisation in the period under consideration.⁶⁸

The author finds a strong correlation of supply shocks between Hungary and the three 'core' EMU countries after 1999, while Slovakia, Latvia and Estonia are found to be relatively highly correlated with two of the three EMU countries in the same period. Considering the entire ten-year period, Slovenia was found to be the country with the highest level of supply shocks symmetry. Similar to the findings of Darvas and Szapáry (2008), the author finds that the correlations for some countries are increasing through time, while decreasing for others. It cannot therefore be concluded that all CEECs are converging on synchronisation with the euro area.

Regarding the correlation of demand shocks, most of the CEECs were found to be negatively correlated with Germany, France and Italy. It is suggested that disinflation, particularly in the second period, explains the asymmetry of demand shocks between the

⁶⁵ Longer periods were used where data was available, e.g. Slovakia, Estonia and Latvia are studied from 1993Q1 and Czech Republic from 1994Q1.

⁶⁶ Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary and Slovenia.

⁶⁷ Germany, France and Italy.

⁶⁸ Two five-year sub-periods were included in the study: 1995Q1 – 1999Q4 and 2000Q1 – 2004Q4.

countries examined. Thus, irregularities in the inflation rates of the CEEC countries may be seen to confirm the concerns expressed by Darvas and Szapáry (2008) described above.

Finally, Savva, Neanidis and Osborn (2010) is the most recent published paper found to concentrate on the business cycle correlation between the CEECs and the euro area. In their study, the authors adopt the HP filter to de-trend a seasonally-adjusted monthly index of industrial production for twelve EU enlargement and negotiating members, as well as for existing euro area members.⁶⁹ The sample period runs until June 2006. Bulgaria, Latvia and Malta are excluded due to data limitations.

One of the main findings of the study is that business cycle synchronisation of the ‘new’ EU members with the euro area has at least doubled, or gone from negative to positive, since the early 1990s. Indeed, business cycle convergence has been so rapid that some countries are found to have surpassed the periphery countries (identified as Greece, Ireland, Portugal and Spain) and approach levels observed in the euro area core.

Table 3 below includes the correlation coefficients produced in this most recent study side-by-side with the coefficients produced in Fidrmuc and Korhonen’s earlier meta-analysis. With the exception of Romania, the positive trend in the degree of business cycle correlation appears to be confirmed despite the mixed findings of some other recent studies.

Table 3: CEEC Business Cycle Correlation Coefficients with the Euro Area

CEEC	Fidrmuc and Korhonen (2006)⁷⁰	Savva, Neanidis and Osborn (2010)⁷¹
Hungary	0.36	0.68
Slovenia	0.26	0.54
Poland	0.25	0.49
Czech R.	0.17	0.50
Estonia	0.14	0.48
Latvia	0.10	-
Bulgaria	0.08	-
Romania	0.07	-0.11
Slovakia	0.01	0.38
Lithuania	-0.07	0.22

⁶⁹ Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, Slovakia, Slovenia, Croatia, Macedonia and Turkey.

⁷⁰ Fidrmuc and Korhonen (2006, p.528)

⁷¹ HP de-trended monthly GDP data for period 1995:1 – 2006:6 (Data for Lithuania begins from 1997:1; data for Estonia ends 2005:12)

2.3: Endogenous Effects of EMU on the OCA Properties: The Empirical Evidence

The application of the Lucas Critique to the OCA theory provided an insight into the dynamic nature of the OCA properties, profoundly altering the way in which the potential costs and benefits of monetary integration were viewed. An examination of the endogeneity effect of monetary union is important as, if proven, it suggests that even if the CEECs do not currently appear to be suitable candidates for EMU they may be better-qualified for membership after accession. It was shown in chapter one that there is a general assumption in favour of the endogeneity hypothesis at a theoretical level. However, it is important to examine the evidence at an empirical level to determine to what extent the endogeneity of the OCA properties can be relied upon in evaluating the economic rationale for monetary integration.

Studies examining the endogeneity effect in the current euro area member countries provide a relevant point of reference. The trade creation effect of monetary integration was the starting point for the Frankel and Rose (1998) endogeneity hypothesis. Rose (2000) presents the first direct empirical examination of the endogeneity hypothesis, studying whether the international trade effects of a common currency exceed those that would arise under a fixed exchange rate regime.⁷² Rose's main finding was that countries using the same currency trade three times as much as comparable countries using separate currencies. The remarkable finding that the formation of a currency union could triple trade between participating countries became known as the 'Rose effect',⁷³ and provoked a sizable empirical literature which aimed to verify whether trade effects of such magnitude were accurate.⁷⁴ Many of the early papers were critical of the econometric techniques and data employed in Rose's study. Persson (2001), for example, focuses on the suggested selection bias and revises Rose's trade effects down to between 13% and 66%.⁷⁵ Rose and Van Wincoop (2001), meanwhile, use an estimated model developed in Anderson and Van Wincoop (2001) to estimate the trade effects of EMU at 58% for the original eleven participating members.⁷⁶

⁷² Rose used the gravity model in his study, employing data between 1970 and 1990 from 186 countries.

⁷³ See Baldwin and Taglioni (2004).

⁷⁴ Baldwin (2006, p.42) writes of the "shrink-the-Rose-effect brigade".

⁷⁵ Baldwin (2006) provides a thorough examination and reassessment of the methodology used to determine the 'Rose effect'.

⁷⁶ The model takes into account pre-currency union trade levels and assumes that countries that trade intensely with each other before forming a trade union will not experience as much of an increase in trade as countries which trade less intensely. Terming this assumption 'multilateral trade resistance', Anderson and Van Wincoop

Following a swathe of studies into the actual trade creation effect of EMU, Frankel (2008b) calculates the central tendency of estimates to be between 10% and 15% in the first few years of currency union.⁷⁷ He proposes a number of explanations for the difference in magnitude of the estimated trade effects of currency unions proposed by Rose and the evidence from EMU. Econometric techniques aside, the short period for which the euro has been in operation and the larger size of EMU countries compared with the small and very small (e.g. Kiribati, Mayotte) trade-dependent countries which were the focus of Rose's earlier study are put forward as possible explanations.⁷⁸ Frankel also finds that larger countries have experienced a smaller boost to intra-monetary union trade in the EMU.

Both the magnitude and the timing of the trade creation effect of monetary integration have been the subject of discussion in the literature. Contrary to Frankel's (2008b) finding of a trade creation effect within the first few years of monetary union, Frankel and Rose (1998), HM Treasury (2003) and Rose (2004) suggest that the full trade effects of monetary integration may take decades. This suggests that the endogeneity theory may only be relied upon over a protracted period of time.

The second important link in Frankel and Rose's endogeneity hypothesis is the effect of trade intensity on business cycle correlation. Fidrmuc (2001) was one of the early contributors to examine the link between the increase in trade intensity and business cycle correlation.⁷⁹ Although the author finds no direct link between trade intensity and business cycle correlation, intra-industry trade is shown to be a significant determinant of the convergence of business cycles. Fidrmuc concludes that his findings confirm the OCA endogeneity hypothesis to the extent that intra-industry trade is positively correlated with trade intensities. In their survey of the literature concerning the convergence of business cycles in the euro area, De Haan, Inklaar and Jong-A-Pin (2008) produce further support for this finding, concluding that trade intensity explains only a fraction of business cycle correlations.

Another interesting point to emerge from Fidrmuc's (2001) analysis is the finding that preparations for EMU were already exerting positive effects on the synchronisation of

(2001) subsequently revise down McCallum's (1995) estimates of the trade-reducing effects of the USA-Canada border from 2,200% to 44%.

⁷⁷ Among the studies considered are Bun and Klaassen (2002), Flam and Nordström (2006), Chintrakarn (2008).

⁷⁸ Although the average size of the EMU-participating countries is substantially larger than the smaller and more open, trade-dependent countries which were the focus of Rose's original study, Frankel (2008b, p.15) concludes that the effects of monetary union do not diminish discernibly with country size.

⁷⁹ Fidrmuc examines a cross-section of OECD countries for the period 1990 – 1999.

business cycles in the early 1990s.⁸⁰ With regard to the prospective accession of CEECs to the EMU, Fidrmuc judges that the intensity of trade between the CEECs and the euro area provides a sound basis for the fulfilment of the OCA criteria in the medium- to long-term.

The empirical literature examining the endogenous effect of monetary integration has also branched out to consider determinants of business cycle correlation other than trade intensity. Artis, Fidrmuc and Scharler (2008), for example, find that while trade intensity, FDI flows and intra-industry trade do tend to strengthen business cycle correlation, the presence of labour market rigidities and divergent fiscal policies lower business cycle correlation irrespective of trade and financial integration. While the authors are optimistic about the effect the Maastricht fiscal convergence criteria will have on business cycle synchronisation, they warn of the risk that fiscal shocks and labour market rigidities may reverse the positive effects associated with the expected increase in trade and financial flows.

The evidence presented so far has demonstrated tentative proof of the endogeneity of the business cycle correlation OCA property. Although studies have tended to find a positive trade creation effect as a result of monetary union, the timing and magnitude of this effect remains the subject of debate. To the extent that the endogeneity of business cycle correlation depends on the intensification of trade links, this casts doubts on the real effect of monetary union on business cycle convergence. Furthermore, studies have shown that the link between trade intensification and business cycle correlation is dependent on the creation of intra-industry trade.

Some recent studies have examined the direct effects of EMU on business cycle correlation in the euro area. Giannone, Lenza and Reichlin (2009) examine the characteristics of business cycles in the euro area from 1970 to 2006.⁸¹ The main finding of the analysis is that business cycles in the euro area have barely changed since the beginning of EMU. While this finding is interesting, the fact that only seven of the thirty-seven annual data points denote time spent in EMU represents a weakness in the study.

Larsson, Gaco and Sikström (2011) take a novel approach to the relationship between European monetary integration and business cycle convergence. The authors examine the degree of convergence of the Danish, Finnish, Norwegian and Swedish business cycles with the euro area from 1970 to 2009. The dramatically different degrees of European integration

⁸⁰ This supports the findings of Darvas, Rose and Szapáry (2005) and Montoya and De Haan (2008) of a 'Maastricht effect', whereby the implementation of structural reforms in a bid to fulfil the Maastricht criteria had the effect of increasing business cycle synchronisation in itself.

⁸¹ Due to the lack of available quarterly data over such a period, the authors use annual GDP per capita at purchasing power parity to analyse the patterns of business cycle correlation. The annual growth rate is considered as the measure of business cycle correlation.

which characterise the Nordic countries provides for an interesting take on the effects of economic and monetary integration on business cycle correlation.⁸² The main finding of the study is that Denmark and Finland (with limited or no exchange rate flexibility vis-à-vis the euro) experienced significant business cycle convergence with the euro area between 1993 and 2007.⁸³ While this provides some evidence of the ‘Maastricht effect’ noted above, the fact that Denmark is not an EMU participant means that the convergence may be attributable to the mere fixing of exchange rates and not as a result of monetary union. No similar effect is detected for Sweden, while Norway is found to show signs of divergence from the euro area. Separately, the authors note that the overheated economies of Ireland and Spain suggest that business cycle synchronisation has not converged enough for the ECB’s single monetary policy to operate smoothly.

Finally, in their examination of the early euro experience of the endogeneity theory Willett, Permpoon and Wihlborg (2010) note a strong word of caution in interpreting simple before-and-after comparisons in the endogeneity theory literature, pointing out the difficulty in distinguishing between the effects of EMU and broader effects of European integration. The authors point out that while the launch of the euro did coincide with rapid growth in reciprocal trade between EMU members, trade with non-EMU members also grew rapidly in that time. More significantly, however, it is found that business cycle correlation of non-euro area countries increased by a greater degree than countries participating in the euro area. The results of this examination undermine further the already weak evidence of the endogeneity of business cycles in EMU.

In order to achieve the required level of business cycle synchronisation without relying on the endogeneity theory after EMU accession, the authors emphasise the importance of ensuring sufficient structural reforms prior to membership if major crises are to be avoided. Observations from Marsh (2009) that economic reforms in Greece, Portugal and Italy slackened after EMU accession are used to emphasise this point. Failure to reform sufficiently, it is noted, may warrant major crises to bring about the reforms required in monetary union. The authors observe: *“Unfortunately, the developments in the eurozone to date do not rule out the possibility that major crises may be needed to stimulate the types of reforms envisioned by OCA optimists”* (Willett, Permpoon and Wihlborg, 2010, p.869).

⁸² Finland is a euro area member; Denmark participates in ERM-II; Sweden is an EU member, but with a floating currency; Norway is a non-EU member with a floating currency.

⁸³ For the same reason as Giannone, Lenza and Reichlin (2009), the authors focus on annual data. The business cycle is measured by de-trending real GDP data using the Hodrick-Prescott filter.

2.4: Implications of the Empirical Evidence for the Current Research Agenda

The aim of this chapter was to examine the empirical OCA literature for evidence of how the OCA properties have been applied to the CEECs and what conclusions have been produced as to the economic rationale of EMU membership for them. Overall, studies have been broadly positive concerning the prospects for CEECs' participation in the euro area. A common conclusion in the empirical studies is that a number of the CEECs are at least as well suited to EMU membership as the current non-core euro area members. Schadler, *et al.* (2005) conclude that EMU membership will bestow substantial net gains on the countries of Central Europe in the long-term.

The use of euro area periphery countries as a benchmark against which to compare the CEECs in their suitability for EMU membership is a prominent feature of the empirical OCA literature. However, recent economic difficulties in the eurozone periphery suggest that CEECs may need to perform considerably better on the OCA criteria if their experience in EMU is to be a positive one. Overheating and asset price bubbles in the Irish and Spanish economies indicate that ECB interest rates were too low for their economies.⁸⁴ Additionally, a loss of competitiveness in Greece and Portugal since euro adoption indicates that structural rigidities have compromised the ability of alternative adjustment mechanisms to operate efficiently.⁸⁵

The assumption that CEECs are suitable candidates for EMU based on their relative position to the euro area periphery in terms of the OCA properties is no longer valid. This calls for a reassessment of the suitability of EMU membership for the CEECs using the cost-benefit approach outlined in section 1.5. Significantly for this analysis, the National Bank of Poland (2009) report predicts an asymmetry in the timing of the costs and benefits of participation in monetary union. Although the expected benefits of monetary union are likely to materialise over the medium- to long-run, there is a greater potential for costs to materialise in the short-run. The threat that costs could potentially materialise shortly after EMU accession underlines the need to achieve a high degree of convergence with the euro area prior to accession.

In outlining the analytical framework for this study in chapter one, similarity of shocks and of policy responses to shocks was identified as the OCA meta property which can

⁸⁴ See Larsson, Gaco and Sikström (2011).

⁸⁵ Willett, Permpoon and Wihlborg (2010) highlight the findings in the political economy literature that major crises may be required for necessary structural reforms in economies like Greece and Portugal to be implemented.

best gauge the potential costs of participation in a monetary union. This property has been widely operationalised in the literature by measuring the degree of business cycle correlation between the CEECs and the euro area. Despite the range of methodologies and sample periods applied, the majority of findings indicate that the CEECs have experienced a significant increase in correlation with the euro area business cycle since the 1990s, albeit from a low, or negative, starting point.⁸⁶ However, none of the published business cycle correlation studies reviewed utilised data after 2006. Additionally, Romania, Bulgaria and Croatia are frequently omitted from the studies. Given the observation that the degree of business cycle correlation with the euro area is changing for some countries, it is important to update these findings to examine the current degree of business cycle correlation.

In the absence of a high degree of business cycle correlation, ECB monetary policy may not be well-configured to economic conditions in the CEECs after euro adoption. The OCA theory suggests that alternative channels may facilitate adjustment to economic shocks in the absence of monetary policy autonomy. Three alternative adjustment mechanisms were identified in the analytical framework in section 1.5. Evidence from the empirical literature, however, suggests that these channels will have a limited scope to facilitate adjustment to shocks in the CEECs.

Flexibility of wages and prices is the first such alternative adjustment channel and an OCA property which dates back to Friedman (1953). A high degree of wage flexibility is of particular importance to ensure that unemployment does not bear the brunt of asymmetric shocks in monetary union. However, evidence from empirical studies suggests that the scope for wage flexibility to facilitate adjustment to shocks is extremely limited. Both the CNB (2010) and NBP (2009) find a low elasticity of wages to labour market conditions in the Czech Republic and Poland. These findings are supported in a study of aggregate wage flexibility in the ‘new’ EU Member States by Babecky (2008). The study finds that in the eight CEECs and three EMU members considered, real wages are inflexible and do not react to changes in the unemployment rate.⁸⁷ Downward rigidities in wages in particular may result in an increase in unemployment in the event of a negative shock to the economy.

Mobility of the factors of production was the second alternative adjustment channel identified in chapter one.⁸⁸ While capital controls within the EU have been banned since the early 1990s, there is evidence that the low degree of financial market development in the

⁸⁶ See Savva, Neanidis and Osborn (2010).

⁸⁷ The eight CEECs considered were: Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia, Latvia and Lithuania. The three EMU members considered were: Austria, Greece and Portugal.

⁸⁸ An OCA property proposed by Mundell (1961).

CEECs could limit the ability of this channel to absorb the effects of asymmetric shocks.⁸⁹ Additionally, regarding the mobility of labour, both NBP and CNB find that the configuration of taxes and benefits, together with legislative rigidities, have a strong negative impact on labour market flexibility. Furthermore, considering the costs of migration, labour mobility is a plausible adjustment mechanism only for permanent, long-term shocks (Bayoumi and Eichengreen, 1993) and unlikely to diminish the costs of monetary union which are likely to materialise in the short-term.

The final alternative adjustment channel discussed in chapter one, the fiscal channel, is unlikely to facilitate adjustment to asymmetric shocks in EMU.⁹⁰ No fiscal transfer mechanism similar to that operating in the USA or between the German Bundesländer operates in the EMU. Additionally, the Stability and Growth Pact (SGP) confines government deficits to 3% of GDP, restricting the scope for national governments to implement counter-cyclical fiscal policies during downturns.⁹¹

Although the EMU limits the extent to which the fiscal channel can facilitate adjustment to economic disturbances, public finances are also a potential source of asymmetric shocks. The CNB (2010) highlighted the drastic consolidation measures being imposed in Greece to demonstrate the risks that unsustainable public finances pose to countries in monetary union. To account for the possibility of more volatile economic fluctuations after accession to the EMU, the IMF report strongly recommends ensuring a prudent government debt burden of no more than 40%-50% prior to membership.⁹² Figure 4 below illustrates the public debt burden on the CEECs as well as the EMU-16 unweighted average and the three EMU participants which required financial rescue packages from the EU-IMF.⁹³ The CEECs can be generally characterised as having a lighter debt burden than the current euro area members. Hungary is the only CEEC whose public debt exceeds the EMU-16 average, and which also exceeds the 60% Maastricht criterion.

⁸⁹ See NBP (2009).

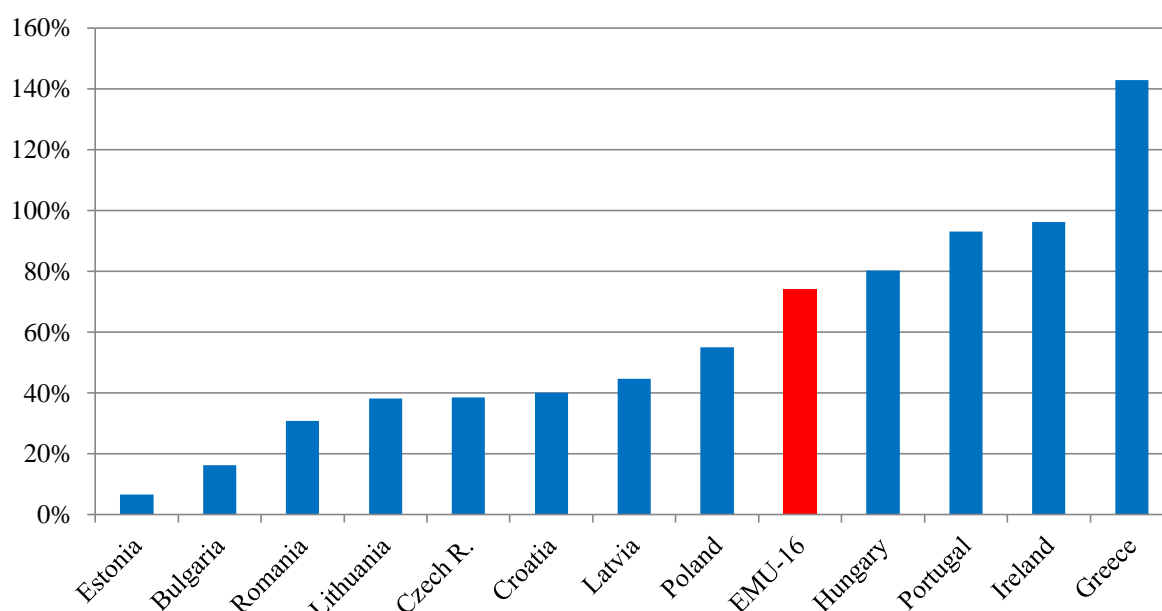
⁹⁰ Kenen (1969) proposed that some degree of fiscal integration is a desirable OCA property.

⁹¹ Although the SGP technically limits the government deficit to 3% of GDP, it has been frequently and persistently breached, especially since the outbreak of the financial crisis in 2008.

⁹² This is stricter than the 60% debt burden limit in the Maastricht criteria.

⁹³ Portugal became the third EMU member to require a financial rescue package in May 2011. See Wise (2011) for more details on the Portuguese rescue package.

Figure 4: Government Gross Debt as Percentage of GDP (2010)⁹⁴



The low proportion of fixed spending in budget expenditure means government spending is generally more flexible in the CEECs than in the euro area.⁹⁵ However, both the NBP and CNB warn of the danger that rapidly rising public debt burdens threaten to change this and even impede their ability to comply with the Maastricht convergence criteria. Figure 5 below shows the state of the CEEC public finances in 2010. With the exception of Estonia, which registered a modest budget surplus, all countries exceed the 3% limit set out in the SGP. Additionally, Hungary's continued accumulation of public debt not only makes EMU membership more risky, but also makes accession in the near future more difficult considering the Maastricht criteria.

Turning to the benefits side of the analysis, most studies report that the CEECs are well-positioned to reap the benefits associated with increased trade integration due to the generally intense trade relations with the existing euro area. It is estimated in the reports that the overall benefits of euro adoption may be expected to add in the region of 0.7% to the annual output growth.

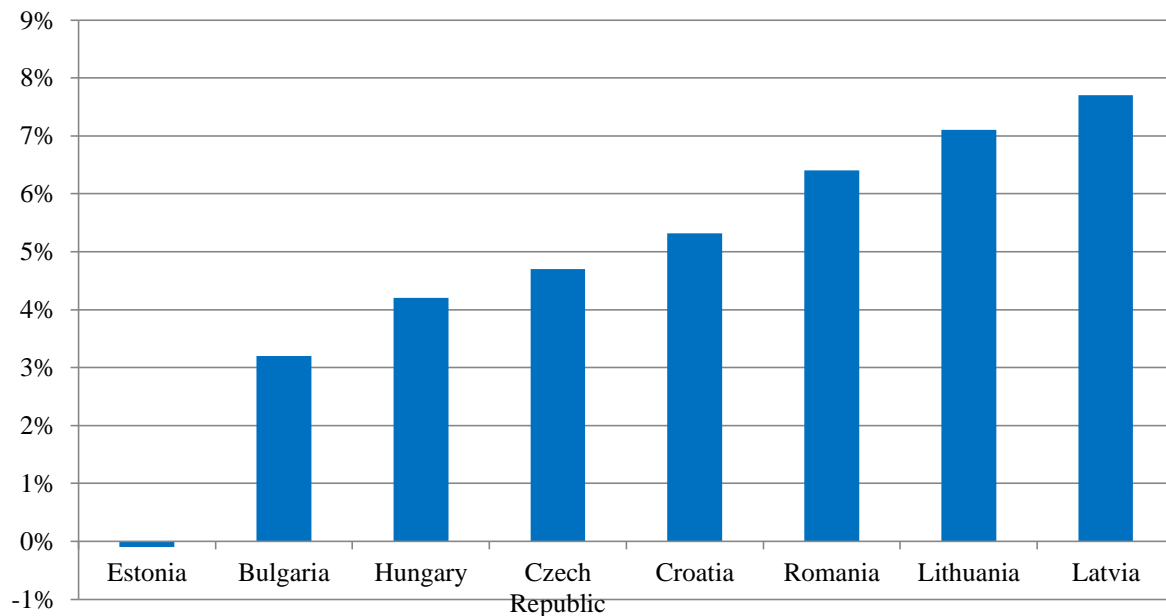
The benefit of an expected fall in interest rates as a result of euro adoption also features prominently in the reports. NBP expects interest rates to fall substantially as a result of euro adoption, by as much as 2.4% in the long-term, leading to expected increase in

⁹⁴ Source: Eurostat database. Data for Croatia is an estimate from the IMF World Economic Outlook Database. See Appendix 1a for full details of EU government finances.

⁹⁵ See NBP (2009).

lending to the private sector. Some reports⁹⁶ emphasise the importance of tight financial supervision and the willingness for fiscal restraint during economic upswings to mitigate the threats of asset price bubbles and wider financial instability.⁹⁷

Figure 5: Government Deficit as a Percentage of GDP (2010)⁹⁸



Finally, weak evidence of the endogeneity effect of monetary union in the case of the EMU suggests that endogeneity of the OCA properties should not be relied upon in considering the economic rationale for membership. It cannot be assumed that the CEECs will become better EMU candidates after accession.

⁹⁶ See, for example, Schadler, *et al.* (2005) and NBP (2009).

⁹⁷ Larsson, Gaco and Sikström (2011) have already mentioned the effect of sub-optimally low interest rates on the Irish and Spanish economies.

⁹⁸ Source: Eurostat database. Data for Croatia is an estimate from the IMF World Economic Outlook Database. See Appendix 1a for full details of EU government finances.

CHAPTER THREE: EMPIRICAL APPLICATION

Having considered the evidence from the theoretical and empirical OCA literature, the aim of this chapter is to empirically apply the OCA theory to the CEECs in order to evaluate the current economic rationale of EMU membership. In accordance with developments in the OCA literature, this will be achieved by embedding the OCA properties in the cost-benefit analytical framework outlined in chapter one.

On the cost side of the analysis, relinquishment of monetary policy sovereignty represents the most significant potential cost associated with formation of a monetary union. Mongelli (2002) identified symmetry of shocks and of policy responses to shocks as an OCA meta property which gauges the potential for this cost to arise. This property has received particularly close attention in the empirical OCA literature, which operationalises it by calculating the degree of business cycle correlation between constituent members of a monetary union. A high level of correlation between members' economic activity increases the likelihood that the single monetary policy will be appropriately configured to economic conditions throughout the union.

Although the alternative adjustment mechanisms identified in chapter one are relevant to the analysis, evidence from the empirical literature demonstrated their limited ability to facilitate adjustment to shocks in EMU. This finding reinforces the importance of achieving a high degree of business cycle correlation prior to EMU membership if potential costs are to be avoided. As such, business cycle correlation will be the main focus of the cost side of the analysis.

Turning to the benefit side of the analysis, elimination of transaction costs and exchange rate risk represent the most significant immediate benefits to arise from monetary union.⁹⁹ The extent to which a country is set to gain from these benefits will be gauged here

⁹⁹ The attendant effects of trade creation and increase in economic growth are likely to develop over a longer period of time. See NBP (2009).

by two indicators. The first is the openness of an economy to trade, which serves a dual purpose in the OCA analytical framework. Firstly, it indicates the extent to which a country will benefit from the elimination of transaction costs and exchange rate risk. Secondly, it indicates the usefulness of an independent monetary policy. McKinnon (1963) showed that the transmission of changes in the international price of tradables to the general domestic price index in open economies reduces the effectiveness of the nominal exchange rate as an adjustment instrument. The second indicator to be considered will be the degree of trade integration between the CEECs and the euro area. This is a more precise estimator of the extent to which the CEECs will benefit from the elimination of transaction costs and exchange rate uncertainty as they will only apply to trade with euro area countries.

The OCA properties will be considered in a static analytical framework. Evidence from over eleven years of EMU has shed doubt on the magnitude of the endogenous effect of monetary union on the OCA properties, indicating that it cannot be relied upon for an improvement in suitability for membership *ex-post*. Indeed, the poor economic performance of the euro area periphery in recent years has highlighted the need to ensure the conditions which justify the economic rationale for EMU membership are in place *prior* to accession.

The cases of Greece, Ireland and Portugal, all of which have required emergency rescue packages since 2010, are testament to the potential threats associated with EMU membership. Above all, their cases demonstrate the utmost importance of ensuring a sustainable fiscal position in monetary union. However, evidence from previous empirical analyses that peripheral countries' business cycles tended to be less correlated with the euro area core indicates that lack of business cycle correlation may also have played a role in generating their economic crises.¹⁰⁰ These three countries will feature prominently in the analysis which follows. Along with the unweighted average of the EMU-16, the OCA properties will be applied to Greece, Ireland and Portugal so as to better understand the relative suitability of EMU membership for the CEECs.

¹⁰⁰ Larsson, Gaco and Sikström (2011) have already suggested sub-optimally low interest rates were partly to blame for economic overheating in Ireland and Spain.

3.1 Business Cycle Correlation

3.1.1 Econometric Methodology

Before measuring the degree of business cycle correlation between countries, it is important to first precisely define the business cycle. Two popular notions of business cycles exist in the literature: the classical business cycle and the deviation business cycle (Artis, Marcellino and Proietti, 2004). The classical business cycle can be defined as the absolute expansions and contractions of economic activity.¹⁰¹ The deviation cycle, meanwhile, can be described as the deviation of economic activity about a trend, i.e. economic fluctuations about a trend. It is the latter definition which represents the more promising and appropriate version of the business cycle¹⁰² and the one which has been the focus of most recent business cycle studies.¹⁰³ Accordingly, it is the deviation business cycle which will be the focus of this study.

Business cycle correlation will be measured by calculating the correlation between de-trended aggregate output data. For the purpose of this study, this method holds a number of advantages over the SVAR approach. Firstly, de-trended aggregate output data captures both the occurrence of shocks and the responses to those shocks. The SVAR approach, meanwhile, is restricted to examining the correlation of demand and supply shocks and does not capture the response to those shocks.¹⁰⁴ As the meta OCA criterion depends on incidence *and* adaptability to shocks, the former approach is the more appropriate and informative for the purpose of this study.

In addition to this, a number of empirical issues have been highlighted with the application of the SVAR technique to the CEECs. Considering that data is available for most CEECs only from the mid-1990s (and in some cases later), the long-run restriction applied in the SVAR model to recover supply and demand shocks from output and inflation data calls the robustness of this approach into question.¹⁰⁵ Indeed, the use of the SVAR model has been

¹⁰¹ See Burns and Mitchell (1946) for an early detailed discussion on the measurement of business cycles.

¹⁰² Artis, Marcellino and Proietti (2004, p.2)

¹⁰³ De Haan, Inklaar and Jong-A-Pin (2008, p.236) state: “A practical reason why most researchers focus on deviation cycles is that most (parametric) measures used to describe the cycle need stationary series as input. Furthermore, since most economies are growing over time classical recessions occur much less frequently than growth cycle recessions”.

¹⁰⁴ Bayoumi and Eichengreen (1993), for example, choose the SVAR approach over the de-trending approach because the de-trending approach fails to distinguish disturbances from responses.

¹⁰⁵ See, for example, Darvas and Szapáry (2008).

questioned even for countries for which much longer time-series are available.¹⁰⁶ In particular, Cooley and Dwyer (1998) question the effectiveness of the restrictions used to identify shocks and the overall reliability of SVARs for identifying the relative importance of shocks.¹⁰⁷

Output data will first be de-trended using the Hodrick-Prescott (HP) filter. Although there is no consensus on the best filter to estimate the business cycle, this is the most widely used in applied work.¹⁰⁸ It has also been employed in many empirical studies researching the business cycle correlation between CEECs and the euro area.¹⁰⁹ Developed by Hodrick and Prescott (1997),¹¹⁰ the conceptual framework behind the filter is that an output time series (y_t) can be decomposed into a growth component (g_t), or trend, and a cyclical component (c_t), such that:

$$y_t = g_t + c_t \quad \text{for } t = 1, \dots, T. \quad (1)$$

The HP filter removes the smoothed trend component from the time series by softly imposing a linearity constraint to the series while at the same time penalising deviations from the trend. This is achieved by minimising the following problem:

$$\min_{\{\tau_t\}} \sum_{t=1}^T (x_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \quad (2)$$

where the first term is the sum of the squared deviations of the actual series from the fitted trend series. The second term represents the sum of the squares of the trend's second differences and is a multiple of the parameter, λ . The parameter, λ , is used to modify the relative importance of the two terms and penalises deviations of the actual series from the fitted trended series. The higher the value of λ , the more linear is the trend component. Hodrick and Prescott (1997) recommend a λ value of 1,600 for quarterly time series data.¹¹¹

¹⁰⁶ See Faust and Leeper (1997).

¹⁰⁷ Cooley and Dwyer (1998, p. 86).

¹⁰⁸ Kaiser and Maravall (2002), who also highlight its widespread use among organisations such as the IMF, OECD and ECB.

¹⁰⁹ The HP filter has been applied in studies by: Boreiko (2003); Artis, Marcellino and Proietti (2004); Darvas and Szapáry (2005, 2008) and Savva, Neanidis and Osborn (2010).

¹¹⁰ An unpublished version of this paper was available since 1980: mimeo from Carnegie-Mellon University, Pittsburgh, PA.

¹¹¹ See Hodrick and Prescott (1997, p. 4).

Despite the popularity of the HP filter, it is not without its weaknesses.¹¹² To ensure the robustness of the results, the band-pass filter developed by Christiano and Fitzgerald (2003) will also be used.¹¹³ In applying the CF filter, only time-series data frequencies within a certain range are passed; high frequency fluctuations and low frequency fluctuations (which reflect the growth trend component) are rejected, thereby indentifying the cyclical component in the time-series.¹¹⁴ This different approach to de-trending should provide robustness to the results obtained using the HP filter.

3.1.2: Data

Seasonally-adjusted quarterly real GDP data from 1995Q1 to 2010Q4 is collected from Eurostat for all EU Member States and Croatia.¹¹⁵ Seasonally-adjusted quarterly real GDP for the same period is also collected for a fixed sixteen-country composition of aggregate euro area activity, against which correlation for each of the countries will be examined.¹¹⁶ Real GDP was chosen over industrial production for purposes of this study having considered the views of De Haan, Inklaar and Jong-A-Pin (2008) that studies of business cycle synchronisation should focus on the broadest possible output variable.

Although data is available for some countries prior to 1995, the distorting effects of the transitional recession on pre-1995 data may significantly and adversely affect the correlation coefficients for the period under examination. The quarterly data frequency was chosen in line with other empirical analyses of business cycle synchronisation.¹¹⁷ The low number of annual data points in the CEECs and the fact that such data may hide shocks to

¹¹² The potential effect of the instability of the endpoint estimate of the data series on the results is an issue frequently raised in the literature. See, for example, Kaiser and Maravall (2002) and Mise, Kim and Newbold (2005).

¹¹³ Together the HP and CF filters are the two most widely adopted filters in the literature.

¹¹⁴ Christiano and Fitzgerald (2003) note, in particular, that their version of the band-pass filter performs better than the HP filter especially towards the end of the sample period where the endpoint issue arises for the HP filter.

¹¹⁵ Real GDP data is measured in millions of the national currency. Data for Greece, Malta and Romania are available only from 2000Q1. Data from Bulgaria and Ireland are available from 1997Q1. For Czech Republic, data is available only from 1996Q1.

¹¹⁶ A number of studies choose to examine correlation with a core euro area member, most frequently Germany (see Fidrmuc and Korhonen, 2006). However, as the European Central Bank will set interest rates based on economic conditions in the euro area as a whole (and not solely in Germany), it is this economy which will be considered in monetary policy decisions. Therefore, it makes more sense to examine correlation with the EMU-16 business cycle for the purpose of this study.

¹¹⁷ See, for example, Artis, Fidrmuc and Scharler (2008), Darvas and Szapáry (2005, 2008) and Mikek (2009)

which the economy has adjusted during the year means that an annual frequency is inappropriate in this instance.¹¹⁸ The use of annual data would also mean that adjustments in output during the year would not be included. Use of monthly output data was ruled out due to the fact that data may be subject to excessive noise and be influenced by seasonal factors.

All data is first logged, before being filtered using each of the filters described above.¹¹⁹ Once the data has been filtered and the cyclical component has been identified for each country and for the euro area, the correlation is tested for each country against the euro area aggregate for the sixteen-year period 1995Q1 to 2010Q4.¹²⁰ The data is then divided into two non-overlapping sub-periods: 1995Q1 – 2004Q1 and 2004Q2 – 2010Q4. The purpose of this exercise is to examine whether there is a tendency of correlation convergence between the individual CEEC business cycles and the euro area. The structural break point was chosen to reflect the accession of ten new Member States to the EU Single Market on 1 May 2004.¹²¹ A third sub-period, stretching from 1995Q1 to 2008Q1, will also be examined so as to examine whether the financial crisis has any effect on the results.¹²²

Finally, three lags are calculated for each of the CEECs and correlated with the euro area aggregate in order to test for which lag length correlation is the highest. As it is more likely that the euro area economic activity influences activity of the CEECs rather than vice versa, lags are not calculated for the euro area. If the highest recorded correlation with the euro area is that without a lag, then the correlation is contemporaneous and the business cycles can be said to move more in tandem. If it is found that the first lag of a country's business cycle is more correlated with the euro area than the non-lagged time-series, it could be concluded that there is a delay in the transmission of the euro area business cycle of approximately three months. For the purpose of this study, high contemporaneous correlation of business cycles is desirable for prospective currency union members.

¹¹⁸ See Mikek (2009).

¹¹⁹ The natural logarithm of all data is used throughout as percentage deviations from the trend are more useful for the analysis. This allows for the relative magnitude of the fluctuations around the trend can be assessed and compared. See Savva, Neanidis and Osborn (2010).

¹²⁰ Data for Bulgaria and Ireland begin from 1997Q1. Data for Romania, Greece and Malta begin from 2000Q1. Additionally, no 2010Q4 data was yet available for Greece and Luxembourg at the time of testing.

¹²¹ This is not true for all countries in the sample. However, it is true for the majority of the countries at the focus of the study and will nonetheless serve its main purpose of providing evidence of convergence or divergence with the euro area business cycle. The sub-periods will be applied to all countries to ensure comparability of the results.

¹²² CNB (2010) found a significant increase in business cycle correlation between a number of European countries and the euro area as a result of the financial crisis. A caveat of this result, however, is that the data was not de-trended. It was decided that 2008Q1 would mark the endpoint of this sub-period as it represents the peak of real GDP achieved in the EMU-16 before real output began its decline.

3.1.3 Results

Before examining the correlation coefficients produced by the tests, it is useful to first visually inspect the data. Figure 6 below presents the business cycles of the CEECs and the three peripheral euro area countries alongside the EMU-16 business cycle. The y-axis represents percentage deviations from the trend which has been extracted from the data using the HP filter.¹²³

The most striking feature of all the business cycles presented is the observable effect of the global financial crisis in 2008. A sharp decline in output in 2009 preceded by a period of accelerating economic growth can be observed in all countries. The peak to trough decline in growth caused by the crisis appears to have been steeper than at any time in the sixteen-year period examined for all countries.¹²⁴

With the exception of Croatia and Romania, growth appears to have recovered in the CEECs in line with the recovery in the euro area aggregate since late 2009. Poland is the only CEEC to experience a deceleration in growth less severe than the euro area aggregate, reflecting the fact that it was the only EU country to avoid recession as a result of the 2008 financial crisis.¹²⁵ However, its recovery has been more muted than elsewhere in Europe and output growth remains below its trend.

Considering the entire sixteen-year period, of the CEECs, the Hungarian and Czech business cycles appear most aligned with that of the euro area over the full period. After some volatility in the mid-late 1990s, output fluctuations of these two countries appear to have fallen broadly in line with those of the euro area. This observation supports the findings of previous studies which generally found the Hungarian business cycle to be most correlated with the euro area.

The business cycles of the Baltic countries appear remarkably similar, especially since 2000, when correlation with the euro area appears to have begun to converge after a period of divergent output patterns. While correlation with the euro area does appear to have increased, fluctuations are markedly more pronounced than the euro area aggregate, with all three

¹²³ Fluctuations below zero do not necessarily signify negative growth, but a change in output which is below the trend. An overall positive trend in growth was observed for all countries considered over the sixteen-year period examined.

¹²⁴ A short period of relative output stability in Bulgaria separates a period of rapid output growth in 1997 from a steep deceleration in growth in 1999. A period of hyperinflation in 1997 in Bulgaria and Romania may distort output data for that period and partly explain the exclusion of Bulgaria and Romania from a number of empirical business cycle correlation studies. See Mikek (2009).

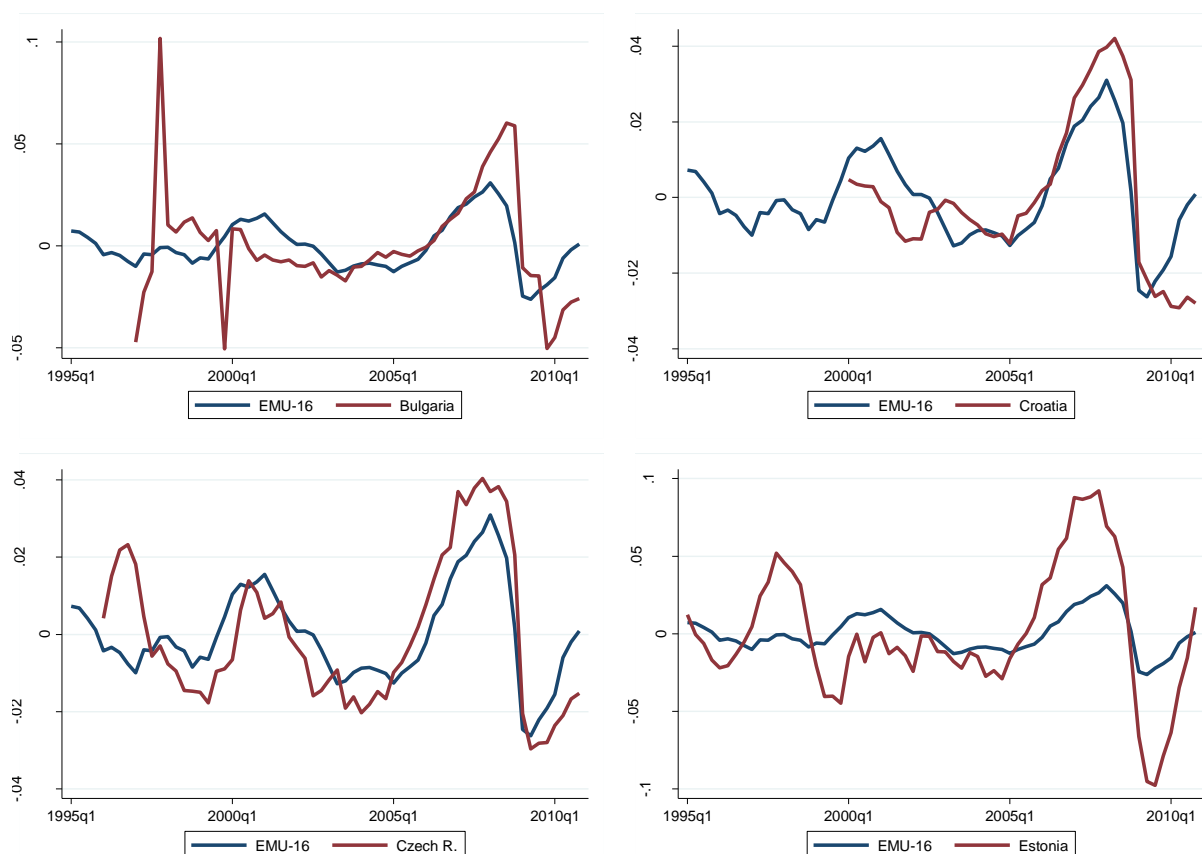
¹²⁵ Based on quarterly GDP growth data from the Eurostat database.

experiencing more rapid growth and deeper recessions in the late-2000s compared with any other country.

Regarding the three other CEECs, business cycles between Bulgaria, Croatia, Romania and the euro area appear to have achieved a considerable degree of convergence until 2008. Croatia and Romania appear to be struggling to recover from recession, while the Bulgarian recovery appears up to three to six months out of sync with that of the euro area.

Evidence from the euro area periphery is mixed. While correlation between the Irish and Portuguese business cycles with the euro area aggregate appears higher than among the CEECs, fluctuation appear markedly more volatile and the economic recovery in late 2010 appears to have faltered in both countries. It is immediately apparent from Greece, however, that despite some degree of alignment between 2005 and 2008, correlation appears very low. The continued sharp decline in output in 2010 enhances this observation.

Figure 6: HP de-trended Business Cycles



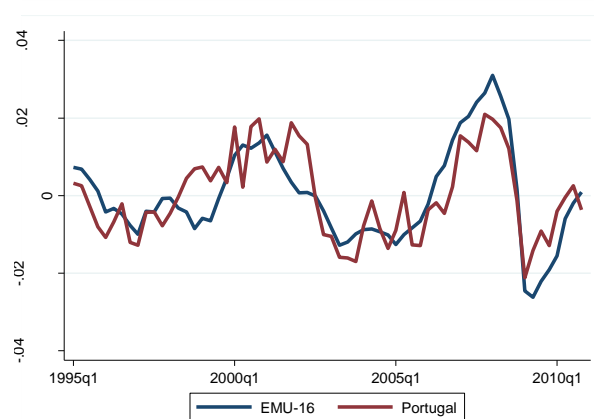
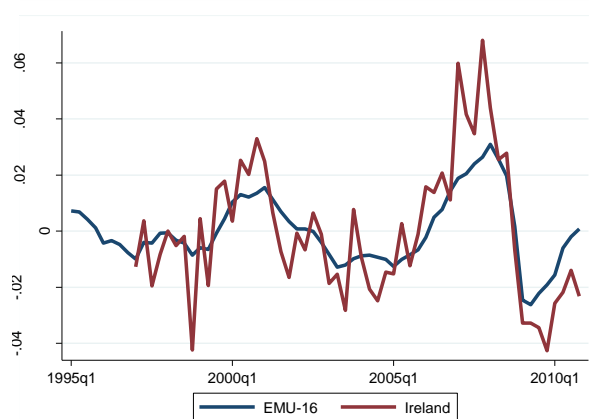
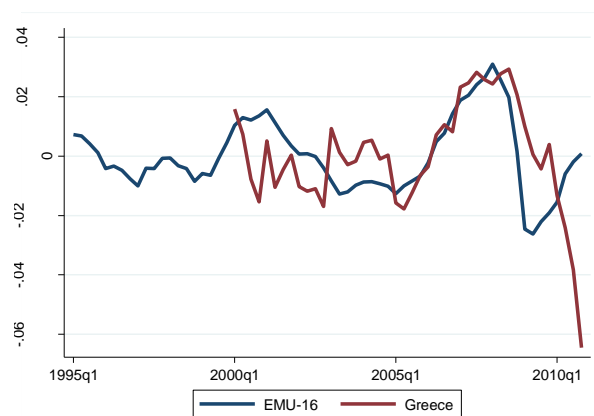
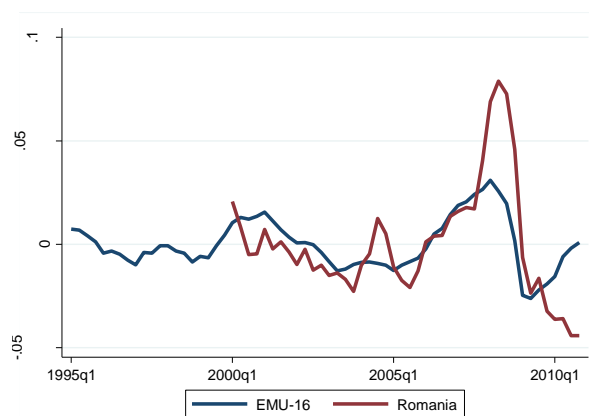
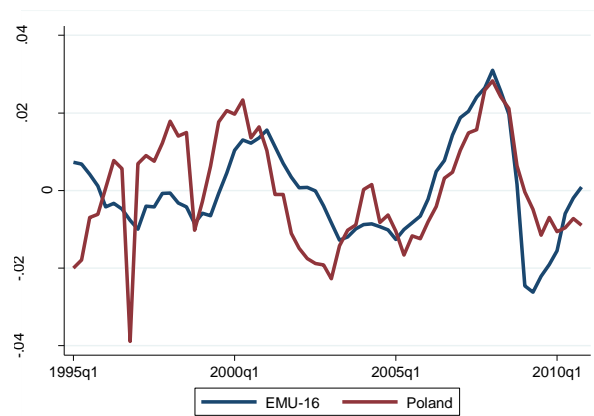
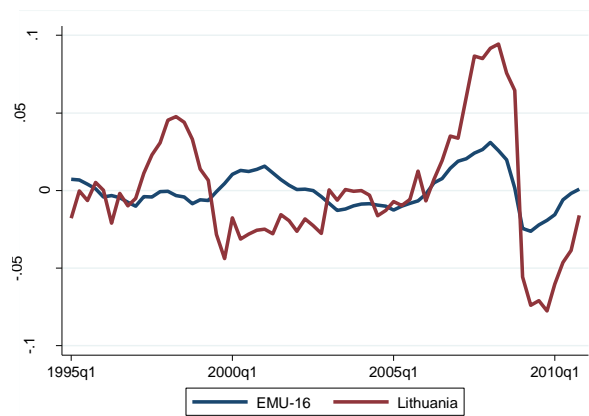
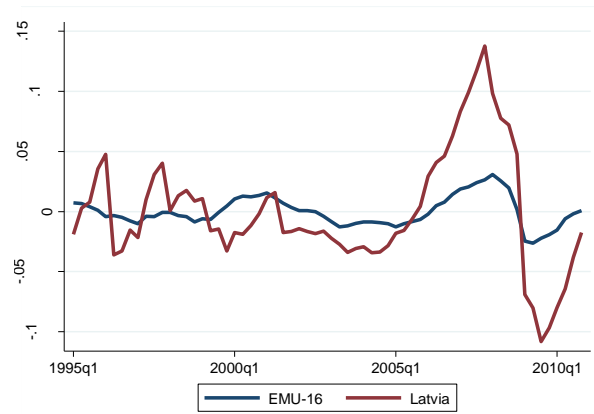
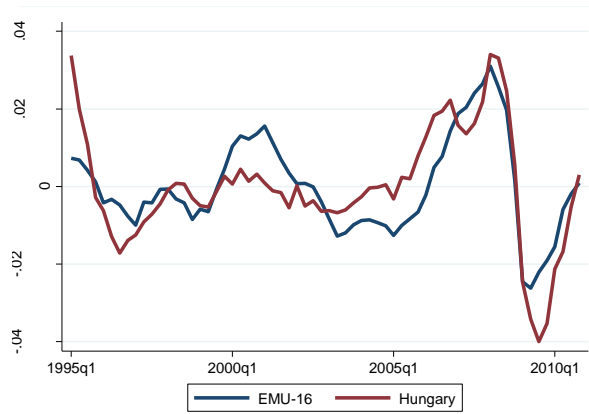


Table 4 presents the Pearson correlation coefficients for the CEECs under examination, three peripheral euro area countries and the unweighted average of the sixteen euro area countries over the full period of the sample and for three sub-periods.¹²⁶ The results are graded according to the coefficients calculated using the HP filter for the full sample period, from highest to lowest. Correlation coefficients calculated using the CF filter, used to ensure the robustness of the results, are included in parentheses beneath.

Table 4: Summary Table of Correlation Coefficients

Country	Pre-crisis: 1995Q1 – 2008Q1	Full Period: 1995Q1 – 2010Q4	Sub-period 1: 1995Q1 – 2004Q1	Sub-period 2: 2004Q2 – 2010Q4
Ireland	0.84 (0.96)	0.86 (0.95)	0.72 (0.92)	0.91 (0.97)
EMU-16	0.81 (0.85)	0.83 (0.87)	0.64 (0.66)	0.90 (0.92)
Czech R.	0.75 (0.82)	0.81 (0.88)	0.36 (0.66)	0.94 (0.98)
Hungary	0.68 (0.82)	0.80 (0.89)	0.54 (0.69)	0.89 (0.95)
Croatia	0.81 (0.82)	0.80 (0.83)	0.39 (0.38)	0.88 (0.90)
Latvia	0.71 (0.89)	0.80 (0.92)	0.15 (0.69)	0.94 (0.98)
Portugal	0.76 (0.88)	0.79 (0.91)	0.71 (0.76)	0.91 (0.98)
Estonia	0.61 (0.75)	0.75 (0.84)	0.01 (0.34)	0.94 (0.98)
Romania	0.79 (0.65)	0.71 (0.66)	0.78 (0.53)	0.74 (0.70)
Lithuania	0.40 (0.53)	0.62 (0.72)	-0.48 (-0.24)	0.92 (0.94)
Poland	0.56 (0.62)	0.58 (0.72)	0.34 (0.47)	0.85 (0.89)
Bulgaria	0.43 (0.44)	0.54 (0.61)	0.10 (0.06)	0.76 (0.77)
Greece	0.64 (0.44)	0.45 (0.27)	-0.03 (-0.85)	0.54 (0.40)

¹²⁶ Full details of the remaining EU countries are detailed in Appendices 2a and 2b.

Overall, the correlation coefficients for the full sixteen-year period produced using HP-filtered data are, on average, 0.05 lower than the coefficients produced using CF-filtered data. Despite this difference, results of the CF-filtered data prove the robustness of the HP-filtered results as the relative ranking of the level of the correlation coefficients is broadly similar.¹²⁷ Germany, Italy, France and the Netherlands are found to be the four most highly correlated with the eurozone aggregate using both filters.¹²⁸ Meanwhile, Greece, Bulgaria, Poland, Lithuania, Slovakia, Malta and Romania are the least-correlated with the eurozone aggregate regardless of which filter has been applied. To simplify the analysis, discussion will now focus on the results of the HP filter.

The first observation to make is that CEEC business cycles have made considerable progress in converging with the euro area. Considering the full sample period, the results here show that in the last number of years the CEECs have achieved a reasonably high degree of business cycle correlation with the euro area. The correlation coefficients for all CEECs are higher than those of the most recent comparable study (Savva, Neanidis and Osborn, 2010) reviewed in chapter two. The results therefore confirm the trend found in some studies that the CEEC business cycles are converging with the euro area.¹²⁹

The division of the sample into two sub-periods confirms the observation that business cycles between the CEECs and the euro area are converging. With the exception of Romania, a strong increase in business cycle correlation with the eurozone can be observed in all other CEECs since the 1990s.¹³⁰ The pace of convergence between the CEECs and the euro area exceeds the observed convergence within the euro area itself. The increase from 0.64 to 0.90 is a positive indication that the business cycles in the euro area are becoming more correlated which should simplify monetary policy decisions of the ECB and improve configuration of monetary policy to economic conditions among EMU participants.

The convergence of the Baltic economies has been particularly strong. Uncorrelated with the euro area in the first sub-period, progress towards convergence has been so rapid that

¹²⁷ Considering the full sample period, the difference between the coefficients produced using the HP and CF filters is largest in the case of Greece, which has a difference of 0.18. Despite this large difference, both methods place Greece as the least-correlated country with the euro area in the entire EU. De Haan, Inklaar and Jong-A-Pin (2008) also found that the findings based on different filters are similar despite the fact that different filters extract different types of information.

¹²⁸ These countries are frequently considered to be among the core euro area countries. See, for example, Darvas and Szapáry (2008) and Mikek (2009). These results support the credibility of the overall findings.

¹²⁹ Savva, Neanidis and Osborn (2010) found that business cycle correlation between the CEECs and the euro area has at least doubled, or gone from negative to positive, since the early 1990s. Fidrmuc and Korhonen (2006), too, observed a positive trend in business cycle convergence between the CEECs and the euro area. Others, such as Darvas and Szapáry (2008) and Mikek (2009) found convergence only for some CEECs.

¹³⁰ Data limitations in the case Romania shortens the first sub-period to 2000Q1-2004Q1 which may explain this unusual finding.

they have overtaken a number of CEECs and peripheral eurozone countries.¹³¹ Poland, previously considered to be among the highest-correlated of the CEECs with the euro area, has been out-paced by the rate of convergence in other countries and is now one of the least-correlated CEECs with the euro area over the full sample period.

The exclusion of post-2008Q1 data from the full sample period to determine the effects the financial crisis has had on the degree of business cycle correlation produces a number of interesting findings. The crisis appears to have had a neutral effect on the average correlation of business cycles within the euro area.¹³² However, the crisis is found to have had a strong and significantly negative impact on the correlation of the Greek economy with the euro area.¹³³ This is unsurprising after the visual inspection of the data illustrated the recent strong divergence of the Greek business cycle. Among the CEECs, there is evidence of a less significant but negative impact on the business cycle correlations of Romania and Croatia with the euro area.

Lags were also applied to the CEEC business cycles over the full sample period to obtain more information on the nature of correlation with the euro area.¹³⁴ With the exception of Poland, adding lags was found to reduce the degree of correlation recorded between the CEECs and euro area.¹³⁵ This indicates that correlation between the eurozone and most CEECs is contemporaneous, which is a positive sign as it strengthens the nature of correlation.¹³⁶

In characterising the degree of business cycle correlation with the euro area, the CEECs can be divided into three sub-groups. In the first are the Czech Republic, Hungary, Croatia and Latvia. The business cycles of these countries have achieved a reasonably high degree of correlation with the euro area and are just slightly lower than the average correlation within the euro area itself. Despite significant recent progress towards business cycle convergence with the euro area, this indicates that the chance that ECB monetary policy may be poorly-configured to the economic conditions in these countries cannot be ruled out.

¹³¹ The negative correlation of Lithuania and extremely low correlation of Latvia and Estonia before EU accession in 2004 are supported by the findings of Fidrmuc and Korhonen's (2006) meta-analysis of earlier CEEC business cycle correlation studies.

¹³² A modest increase in correlation is observed by including post-2008Q1 data, although this may be accounted for by the generally positive convergence trend observed over the full sample period.

¹³³ This is confirmed by results from both filters.

¹³⁴ Full details of the results can be found in Appendices 2c and 2d.

¹³⁵ This was not found to be the case when the CF filter was applied to the data.

¹³⁶ Darvas and Szapáry (2008) found that lags of up to three quarters produced the highest correlation coefficients between some CEECs and the euro area.

Considering the strong evidence that CEEC business cycles continue to converge with the eurozone, however, this risk should continue to shrink as time passes.

Estonia and Lithuania can be placed into the second sub-group. These countries exhibit a lower degree of correlation with the euro area than the countries identified in the first sub-group. However, evidence of exceptionally rapid convergence to the euro area business cycle is detected from both countries since EU accession. Although there is a risk that ECB monetary policy may be poorly-configured to economic conditions in these countries considering evidence from the full sample period, this risk should be expected to decrease rapidly given the observed trend of rapid convergence.

Romania, Poland and Bulgaria can be placed in a third sub-group. These countries also exhibit a lower degree of business cycle correlation than the eurozone average. However, their rate of convergence is somewhat slower than that observed in Estonia and Lithuania. For these countries a more substantial, although weakening, risk remains that the ECB's monetary policy could create economic imbalances.

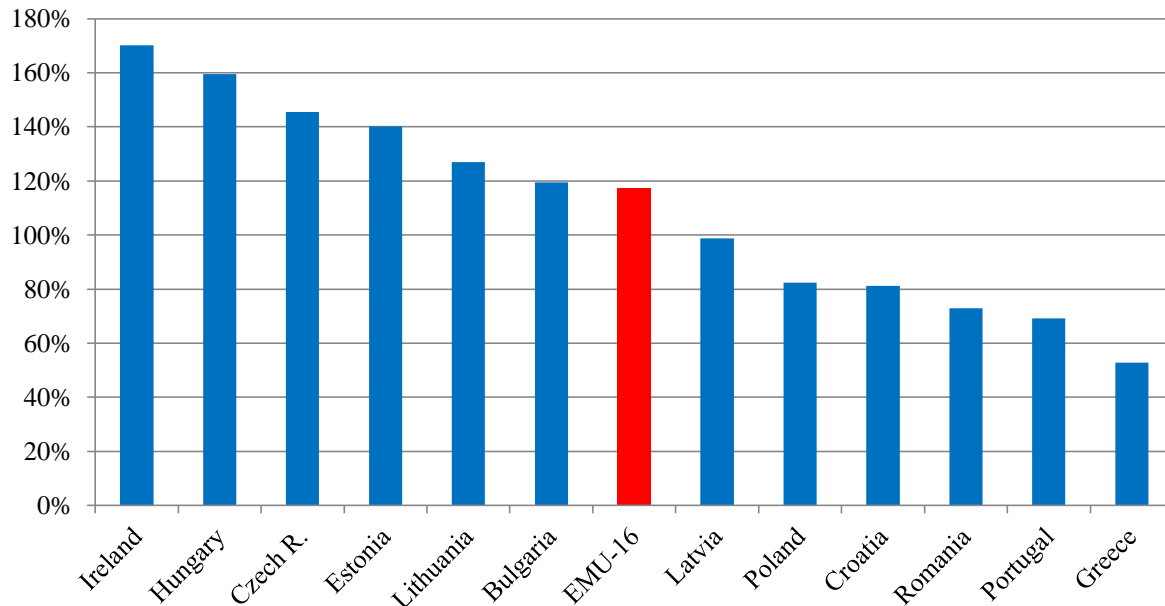
3.2: Openness and Trade Integration

Originally proposed by McKinnon (1963) as an OCA criterion, the openness of an economy to external trade serves a dual purpose in the OCA analytical framework. The cost to open (and often small) economies of relinquishment of sovereign monetary policy can be expected to be lower for countries whose economies depend significantly on international trade. Additionally, openness to trade can be viewed as an indicator of how much a country will benefit from the formation of a monetary union. Tower and Willett (1976) were one of the first to highlight the enhanced usefulness of money in monetary union being of particular benefit to those countries which are more open to trade. The savings in terms of transaction costs and the elimination of exchange rate risk will be of greater benefit to a country the greater it depends on trade.

Figure 7 below presents the degree of openness of each of the CEEC economies, the three eurozone periphery countries and the unweighted average of the EMU-16. Openness is

calculated as the sum of imports and exports as a percentage of GDP.¹³⁷ To take account of volatile trade data as a result of the financial crisis, the 2008-2010 three-year average is calculated instead of focusing on just one year.

Figure 7: Total Imports and Exports as Percentage of GDP (2008-2010 average)¹³⁸



The data demonstrate that the degree of openness varies widely both among the CEECs and among eurozone economies. With the combined value of imports and exports totalling 117% over the past three years, the average degree of openness in the euro zone is very high. Five CEECs (Hungary, Czech Republic, Estonia, Lithuania and Bulgaria) exhibit an extremely high level of openness and exceed the average degree of openness in the EMU. Just Latvia, Poland, Croatia and Romania are less open than the euro area average. As the two largest CEECs in this study, Poland and Romania may be expected to demonstrate lower trade dependence given the tendency of larger, more-diversified countries to rely less on international trade. Nevertheless, with combined imports and exports amounting to 73% of GDP, Romania, as the least open of the CEECs studied, still exhibits a reasonably high degree of international trade dependency.

The openness of the three euro zone peripheral countries varies extremely widely. All CEECs in the sample exceed the degree of openness observed in Greece and Portugal.¹³⁹

¹³⁷ All data is sourced from Eurostat. Exports and imports are of both goods and services at current prices and are non-seasonally adjusted.

¹³⁸ Full details for all EMU countries including a year-by-year breakdown can be found in Appendix 3a.

Such low levels of openness are surprising given the relatively small size of these economies and indicate a relatively low potential to generate benefits from participation in monetary union. At the other end, however, none of the CEECs match Ireland in their degree of openness. Above all, this demonstrates the diversity of the economies participating in the EMU.

The data presented here indicate that given the CEEC economies depend to a reasonably high degree on international trade, the effectiveness of the nominal exchange rate as an adjustment instrument is relatively low. This is especially true for the exceptionally highly trade-dependent economies of Hungary, the Czech Republic, Estonia, Lithuania and Bulgaria.

However, it is the degree of trade integration with the participating members in monetary union which is a more accurate indicator of how well-positioned an economy is to benefit from monetary integration. Upon accession to monetary union, a country should be directing a substantial share of its exports to and sourcing a substantial share of its imports from other currency union members if it is to benefit from the elimination of transaction costs and exchange rate risk. Otherwise trade will continue to be subject to transaction costs and exchange rate risk with non-monetary union participants. In Figure 8, the degree of trade integration with the euro area is calculated as the sum of imports and exports with the euro area as a percentage of GDP.¹⁴⁰ Again, the average over the three-year period from 2008 to 2010 is considered so as to account for the volatility of the data.

The trade integration data presents a markedly different picture to the general openness data. On average, 37% of euro area countries' international trade is with other euro area countries. The particularly stark difference in Ireland, for example, may be accounted for by its intense trade relations with non-euro area countries including the UK and the USA.¹⁴¹ Similarly, intra-CEEC trade may account for much of the difference observed among the CEECs.¹⁴² The exceptionally low amount Greece trades with other euro area members is particularly striking. Despite participating in the EMU for over eleven years, imports and

¹³⁹ With the combined value of imports and exports totalling just 53% of GDP Greece is, along with France, the least-open of all euro area countries.

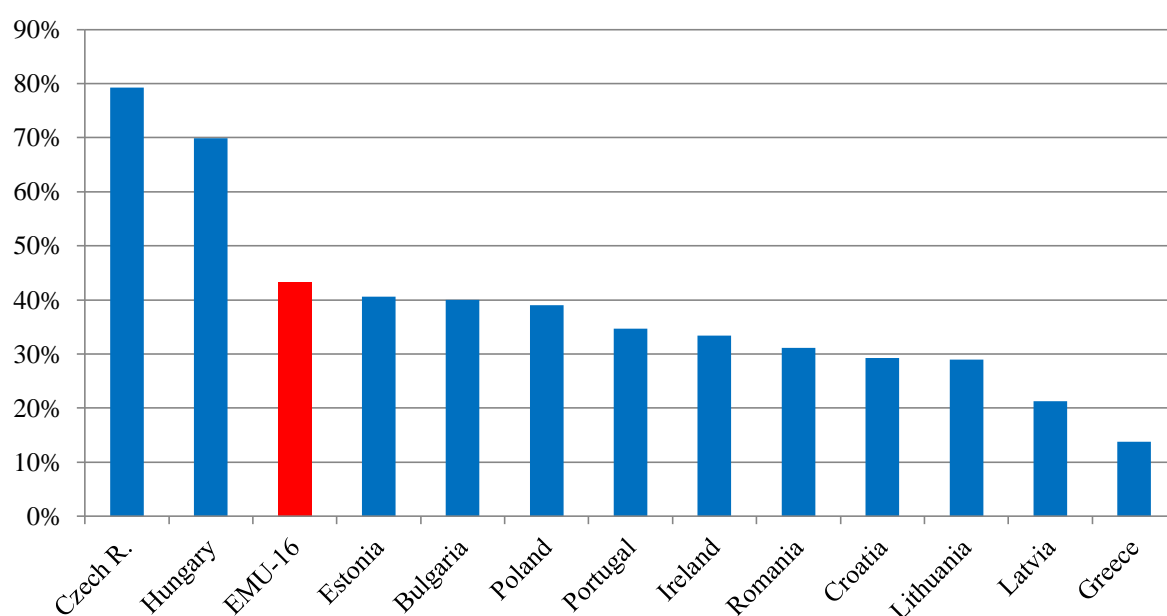
¹⁴⁰ Trade integration of current eurozone members is calculated as the sum of imports and exports with other euro area members as a percentage of GDP. The EMU-16 is the unweighted average of those calculations.

¹⁴¹ Thus, while the openness of its economy reduces the cost of relinquishing monetary policy autonomy, deep trade relations with other non-EMU countries limits the extent to which Ireland can benefit from the elimination of transaction costs and exchange rate uncertainty.

¹⁴² This observation highlights a limitation of the static nature of this analysis. As the EMU expands to include more countries (such as the accession of Estonia on 1 January 2011), the figures here will change. Assuming Latvia, for example, enjoys close trade links with Estonia, its accession to the euro area will place Latvia in a better position to benefit from eurozone accession.

exports with the euro area total just 14% of GDP, by far the lowest of any CEEC or euro country.¹⁴³

Figure 8: Total Imports and Exports with the Euro Area as Percentage of GDP (2008-2010 average)¹⁴⁴



Based on the data, the CEECs can again be divided into three groups. In the first are the Czech Republic and Hungary. Their economies are extremely highly dependent on trade with the EMU; the value of trade exceeds 70% of output in both cases. This substantially exceeds the average found within the eurozone and indicates that these two economies are particularly well-positioned to benefit from EMU membership.

Estonia, Bulgaria and Poland can be placed in the second group. All three exhibit a degree of trade integration similar to the EMU average and are better-placed to benefit from euro area membership than the three EMU peripheral countries of Portugal, Ireland and Greece.

The final group includes Romania, Croatia, Lithuania and Latvia. The degree of trade integration between these countries and the euro area is relatively low, falling short of the levels observed in Ireland and Portugal, although above the level observed in Greece. The

¹⁴³ Italy is next lowest, where the comparable figure was 20%.

¹⁴⁴ Full details for all EU countries including a year-by-year breakdown can be found in Appendix 3b.

data for these countries indicate that they will benefit less from the elimination of transaction costs compared to most other European countries.

3.3: Economic Rationale of EMU Membership for the CEECs

Having highlighted the limited ability of alternative adjustment mechanisms to prevent economic imbalances in the event of an asymmetric shock, attention on the cost side of the analysis has focused on the degree of business cycle correlation between the CEECs and the euro area. The danger that the single monetary policy of the ECB may not be well-configured to the economic conditions of an acceding country is a threat which may arise in the short-term. The immediate threat that costs might arise in the short-term underlines the importance that the economic rationale of EMU membership is justified for each CEEC prior to membership. The weak endogenous effect of EMU membership on the OCA properties and economic crises in the eurozone periphery further underscore the necessity to guarantee, as far as possible, that participation in the EMU will have a positive effect on the welfare of acceding countries.

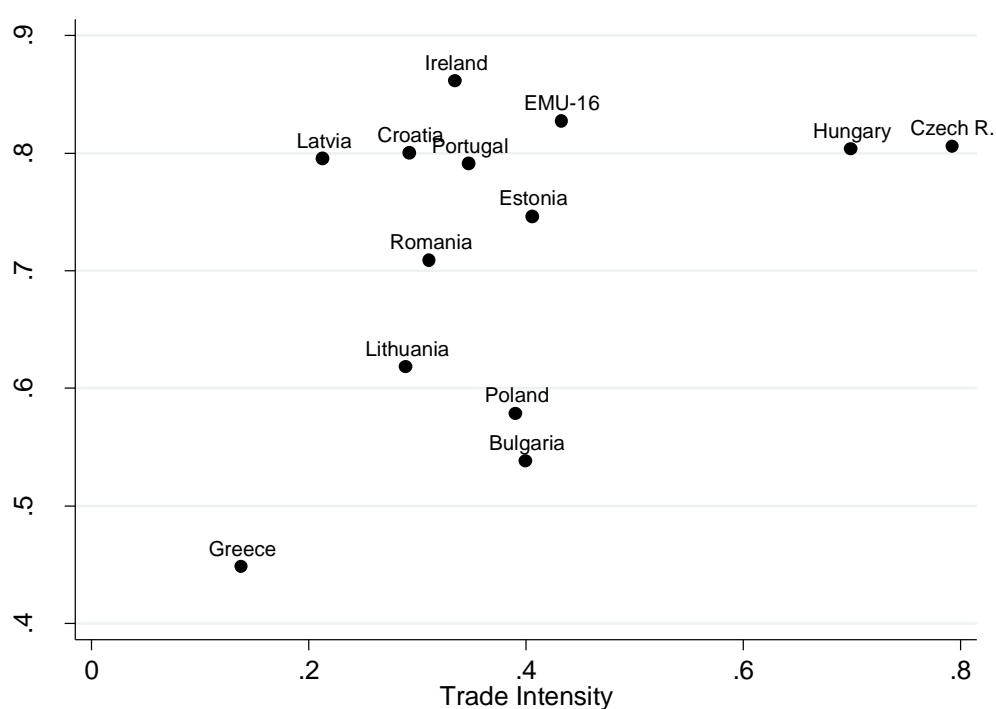
On the benefit side of the analysis, attention focused on the openness of the CEECs to trade with the euro area. Although benefits in the form of elimination of transaction costs and exchange rate risk with other EMU members will also be felt in the short-term, attendant trade creation and growth boosting effects will take longer to materialise.

Before analysing the findings in detail, it is useful to first illustrate the results of the two main OCA properties examined. Figure 9 below plots the relative performance of the CEECs, the three EMU peripheral countries and the EMU-16 with regard to the degrees of business cycle correlation and trade intensity with the euro area. Concerning suitability of participation in EMU, countries placed in the top right corner, which demonstrate high degrees of both business cycle correlation and trade intensity with the euro area, can be considered the best candidates. Countries towards the bottom left hand corner, meanwhile, can expect to benefit least from participation in EMU.

From the graph, the Czech Republic and Hungary appear to be the best-positioned of the CEECs to benefit from euro adoption. None of the remaining countries examined clearly out-perform the average EMU-16 on the basis of these two criteria. Another observation from the graph is the exceptionally poor positioning of Greece. Greece's especially low degree of

trade intensity with the euro area means that it has benefited little from the elimination of transaction costs. Additionally, its low degree of business cycle correlation with the euro area implies that Greece is most at risk of suffering from an ECB monetary policy ill-configured to its economic conditions. In fact, the results of both tests found that Greece was the least suitable country for participation in EMU of all EU countries. The fact that Greece was the first eurozone country to require emergency external financial assistance indicates that this may indeed be the case and lends credibility to the OCA properties in evaluating the economic rationale of monetary integration.

Figure 9: Business Cycle Correlation and Trade Intensity¹⁴⁵



In evaluating the economic rationale of EMU membership for the CEECs, it is useful to divide the countries into two groups based on their current exchange rate arrangements. Estonia has adopted the euro already, although before 2011 it, like Lithuania and Bulgaria,

¹⁴⁵ Business cycle correlation refers to the results obtained using the HP filter for the full sample period (1995Q1 – 2010Q4). Trade intensity is the average of the sum of imports and exports with the euro area over the three year period (2008 – 2010).

operated a currency board arrangement with the rate fixed to the euro.¹⁴⁶ Latvia, too, operates a fixed exchange rate regime, although one with slightly more flexibility to move about a narrow band. These four fall into the first group. The second group includes Croatia, the Czech Republic, Hungary, Poland and Romania which operate flexible exchange rate regimes.

By operating fixed exchange rate regimes, Estonia, Latvia, Lithuania and Bulgaria have effectively relinquished monetary policy autonomy and have thus already accepted the primary cost associated with participation in the EMU.¹⁴⁷ The decision to operate fixed exchange rate arrangements is unsurprising considering the small, open nature of their economies.¹⁴⁸ The significant role played by internationally-traded goods and services in their economies severely limits the actual effectiveness of a nationally-tailored monetary policy and supports the decision to choose a fixed exchange rate regime.

Fixing their currencies to the euro while remaining outside it, these countries would effectively assume the cost of EMU membership without benefiting from the elimination of transaction costs. To the extent that participation in monetary union precludes future devaluations, stronger credibility of the fixed exchange rate is a second benefit which these countries will miss out on by remaining outside the EMU. As such, it may be argued that these countries may be better-off in EMU than outside of it. Of the four, Estonia and Bulgaria are particularly well-positioned to benefit from membership considering their intense trade relations with the EMU-16 members.

The conclusion that the Baltic States and Bulgaria would be better-off as full EMU participants is not to suggest that threats do not exist. The relatively low degree of business cycle correlation between Bulgaria and the EMU-16, in particular, suggests ECB monetary policy may not be well-configured to economic conditions there. The below-average degree of business cycle correlation between Estonia and the EMU-16 compared with current members, meanwhile, suggests that as an EMU member Estonia still faces a risk of asymmetric shocks. However, both the Baltic States and Bulgaria have been without nationally-tailored monetary policy for some years and, as such, EMU-accession should not represent any *additional* cost.

¹⁴⁶ Estonia operated a currency board arrangement until 31 December 2010. As all data has been used up until that date, the analysis in the case of Estonia is backward-looking and compares its suitability for EMU participation with the other CEECs.

¹⁴⁷ The Impossible Trinity principle was used in chapter one to demonstrate the incompatibility of a fixed exchange rate regime and monetary policy autonomy in an environment of high capital mobility.

¹⁴⁸ International trade accounts for between 99% and 140% of GDP in the four.

Although monetary policy autonomy has already been relinquished in these countries, policymakers still have the scope to ensure the threat of economic imbalances arising through unemployment, inflation or an unsustainable balance of payments are minimised. Three policy recommendations are of particular importance.

Firstly, it is vital that structural reforms are implemented as soon as possible to enhance the flexibility of the labour market and ensure unemployment does not bear the brunt of economic disturbances. Labour legislation and the tax and social welfare systems must be configured so as to ensure overall labour market flexibility. In particular, downward wage and price rigidities should be minimised. This should be done as soon as possible regardless of EMU accession as fixed exchange regimes in these countries have already removed the nominal exchange rate as an adjustment instrument.

Secondly, prudent fiscal policies which guarantee the sustainability of the government finances and which counteract economic overheating must be ensured. The Baltic States and Bulgaria enjoy relatively light debt burdens compared to other European countries. It is of vital importance that current deficits in some are contained so as to ensure this continues. Sovereign debt crises in the EMU underline the importance of prudent fiscal policy in monetary union. Estonia's exceptionally prudent fiscal position serves as an example not only for other CEECs preparing for EMU membership, but also for other eurozone countries generally.

Finally, steps must be taken to guarantee tight financial market supervision so as to ensure an expected fall in interest rates as a result of euro adoption does not lead to economic overheating. The bursting of asset price bubbles which have afflicted the Irish and Spanish economies demonstrate the real threat to a country's financial stability when financial regulators and fiscal authorities fail to act to dampen economic overheating.

Of course, these three policy recommendations are also relevant for the remaining CEECs which face the future prospect of EMU membership. For Croatia, the Czech Republic, Hungary, Poland and Romania it is of vital importance that these policy recommendations are acted upon prior to euro adoption in order to minimise the costs associated with EMU participation.

Considering their degree of business cycle correlation and intense trade links with the euro area alone, the Czech Republic and Hungary would be considered the best candidates for EMU membership of the CEECs studied. Evidence from the study of business cycle correlations with the euro area found that the Czech and Hungarian business cycles were the most correlated of the CEECs with the euro area. Although their degree of correlation

exceeded that of Portugal and Greece, it fell short of the EMU-16 average, indicating that despite progress towards convergence with the euro area business cycle, the risk that monetary policy could be ill-configured to their economic conditions remains. Considering this finding, cautious advice would be to recommend that the Czech Republic and Hungary wait until the observed trend of increasing business cycle convergence reaches the levels observed in the euro area core.

One serious caveat to Hungary's potential EMU membership which cannot be ignored is its high level of public debt. Sovereign debt crises in the eurozone periphery emphasise the threat posed by unsustainable fiscal positions. Hungarian policymakers must make a concerted effort to reduce the public debt burden, not only to reduce the potential for asymmetric fiscal shocks, but also in order to fulfil the Maastricht criteria. Considering that government debt must not exceed 60% of GDP for EMU accession, it may be some years before Hungary abrogates its derogation to adopt the euro.

Poland and Romania are the two largest CEECs considered in this research. Their relatively low degree of business cycle correlation with the euro area and continued use of nationally-tailored monetary policies indicate that accession to the EMU has the potential to be costly for the two economies. Their relatively low degree of openness and trade intensity with the euro area indicate that they do not stand to benefit as much as some smaller trade-dependent CEECs from euro adoption. On balance, it can be concluded that at this time the threat of costs from participation in EMU outweighs the likely benefits for Poland and Romania. Both would be well-advised to wait for a higher degree of business cycle correlation with the EMU core before committing to euro adoption.

Finally, Croatia's reasonably high degree of business cycle correlation with the euro area relative to the other CEECs may be somewhat surprising considering that it has not yet become an EU Member State. Although its current degree of trade intensity with the euro area is relatively low, this should be expected to increase when Croatia becomes a member of the European Single Market. Assuming the general trend of business cycle convergence continues, Croatia should be well-positioned to benefit from EMU accession after its two years' participation in ERM-II.¹⁴⁹

¹⁴⁹ After two years' participation in ERM-II, 2015 is the earliest that Croatia can feasibly join the EMU.

CHAPTER FOUR: CONCLUSIONS

The aim of this dissertation was to evaluate the economic rationale of EMU membership for nine CEECs. Currently, seven are legally obliged to fulfil the Maastricht criteria and adopt the euro. The ECB expects Croatia to face the same obligation when it joins the EU in 2013. Although Estonia adopted the euro on January 2011, it was also included as the data used in the research pre-date its EMU accession. Findings in Estonia's case will therefore constitute a retrospective analysis of the justification for joining the euro.

This research is important because an understanding of the economic rationale for euro adoption is essential if potential economic costs associated with it are to be minimised. CEEC policymakers retain the freedom to control the pace of progress towards EMU. An understanding of the economic rationale for EMU membership should be influential in formulating policy decisions to ensure the appropriate timing in progress towards EMU accession. Economic difficulties and sovereign debt crises which have afflicted a number of eurozone countries in recent years are testament to the fact that economic rationale has not played enough of a role in the official procedures for euro adoption. This further underscores the need to justify EMU participation for the CEECSs on economic grounds if similar costs are to be avoided.

To achieve the aim of the dissertation, analysis of the economic rationale of EMU membership for the CEECs was grounded in the theory of optimum currency areas. A cost-benefit analytical framework was adopted whereby the CEECs were analysed according to a number of OCA properties identified in the literature. While similarity of shocks and policy responses to shocks indicate the extent to which participation in monetary union may be costly, three other OCA properties were identified which would diminish this cost: price and wage flexibility, mobility of factors of production and fiscal integration. On the benefit side, openness to trade, especially with other EMU members, and the potential for credibility gains were identified as determinants of the potential benefits of EMU membership.

An examination of the evidence from the empirical literature found generally positive conclusions that EMU membership is likely to bestow considerable net gains on the CEECs

in the long-term. A common feature of the studies reviewed was the use of at least one peripheral eurozone country as a benchmark against which to gauge the suitability of EMU membership. However, the assumption that CEECs are suitable candidates for EMU based on their relative performance to the euro area periphery in terms of the OCA properties has been invalidated. Since these studies were conducted, economic difficulties and sovereign debt crises in some peripheral countries have highlighted the need for a more stringent assessment of the economic rationale for euro adoption. Weak evidence of the endogenous effect of EMU membership on the OCA properties has further emphasised that the economic rationale for euro adoption must be justified prior to accession. Overall, these findings call for a more stringent assessment of the suitability of EMU membership for the CEECs if potential costs are to be mitigated.

Evidence of the limited scope of alternative adjustment mechanisms to facilitate adjustment to shocks in the CEECs led to a focusing of attention on the similarity of shocks and policy responses to shocks as the key determinant of the likely costs to arise from participation in EMU. This OCA property has been widely operationalised in the empirical literature by examining the degree of business cycle correlation between the CEECs and the euro area. For the purpose of this study, it was decided to employ the de-trending approach to measuring business cycles. The main finding of the business cycle correlation tests was that CEEC business cycles have made considerable progress converging euro area in recent years. Despite this observation, however, CEEC business cycles still appear to be less correlated with the EMU-16 aggregate than most countries currently participating in the eurozone.

On the benefit side of the analysis, attention focused on the degree of trade intensity between the CEECs and the euro area. The Czech and Hungarian economies were found to have an extremely high degree of trade intensity with the euro area which indicates that they are especially well-positioned to benefit from the elimination of transaction costs. The remaining CEECs were found to have a lower degree of trade intensity with the euro area than the average EMU-16 participant.

Overall, it was concluded that EMU accession would not represent any additional cost for Bulgaria, Latvia and Lithuania. By fixing their currencies to the euro, these countries have effectively forgone the ability to conduct nationally-tailored monetary policies as demonstrated by the Impossible Trinity principle. Remaining outside the EMU means these countries would incur the costs of a fixed exchange rate without benefiting from the potential elimination of transaction costs. Nor would they gain the added credibility derived from the preclusion of future exchange rate devaluations. Unfixing their currencies to operate a

flexible exchange rate regime makes little sense at this stage considering that the small, open nature of their economies would restrict the effectiveness of a nationally-tailored monetary policy. On balance, therefore, it can be concluded that Bulgaria, Latvia and Lithuania should proceed with efforts to fulfil the Maastricht criteria and adopt the euro.

Based on its degree of business cycle correlation and trade intensity with the euro area, the Czech Republic is the best CEEC candidate studied for participation in the EMU. Although it is extremely well-positioned to gain from the elimination of transaction costs, a significant but shrinking threat remains that asymmetric shocks could generate economic imbalances in its economy as an EMU participant. If the observed trend of business cycle convergence with the euro area continues, the ECB's monetary policy should soon be well-configured to Czech economic conditions. Once closer convergence is achieved, the Czech Republic will be well-positioned to realise a net gain from participation in the eurozone.

Based on its degree of business cycle correlation and trade intensity with the euro area, Hungary also appears well-positioned among the CEECs to benefit from EMU membership. However, one major caveat to this is its extremely high government debt. Considering the effects of sovereign debt crises in the euro area periphery, Hungary would be well-advised to substantially reduce its debt before proceeding with euro adoption. Considering it currently exceeds the Maastricht Treaty government debt limit by 20%, it may be some time before Hungary will be in a position to adopt the euro.

Poland and Romania are the two largest CEECs included in this analysis and as such their ability to benefit from nationally-tailored monetary policy is higher than in smaller, more open CEECs. Their average or low degree of trade intensity and their low degree of business cycle correlation with the euro compared to other European countries suggest that the threat of costs posed by EMU membership currently outweigh the potential benefits. Both countries should wait for a higher degree of business cycle convergence with the euro area before proceeding with euro adoption.

Although Croatia cannot technically join the euro until 2015, it already ranks favourably among the CEECs with regards suitability for euro adoption. Assuming that accession to the European Single Market will have the effect of increasing trade intensity with the eurozone and that its business cycle continues to converge with that of the euro area, Croatia should be well-positioned to benefit from EMU membership when the time comes.

Finally, participation in EMU should be expected to produce no additional costs for Estonia. Elimination of transaction costs with other eurozone countries should facilitate deeper trade relations. Additionally, to the extent that membership of the euro precludes any

future devaluations, EMU membership should provide added exchange rate certainty which should facilitate long-term inward investment. In the long-run, the EMU participation should boost overall economic growth in Estonia through heightened competition and greater microeconomic efficiency.

Three key policy recommendations can be made to Estonia and the remaining CEECs in order to minimise the potential costs associated with EMU membership. Firstly, labour legislation and the taxes and benefits systems should be reformed so as to increase labour market flexibility. Evidence from the literature suggests that labour markets in the CEECs (and in the EMU) are not flexible enough to facilitate adjustment to asymmetric shocks. Structural reforms in these areas will be imperative to ensure that unemployment does not bear the brunt of asymmetric shocks. Secondly, prudent and flexible fiscal policies must be in place to ensure the sustainability of the public finances and be prepared to react to threats of overheating in the economy. Sovereign debt crises in the EMU in particular underline the need to ensure sustainability of public finances in the absence of a fiscal transfer mechanism. Finally, strict financial market supervision must be enforced to ensure the stability of the financial sector. Regulators must be prepared for the threat that increased private sector lending as a result of an anticipated reduction in interest rates could lead to asset price bubbles and destabilise the wider economy.

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APPENDICES

Appendix 1a: EU Government Finances (2010)¹⁵⁰

Country	Debt	Deficit
Austria	72.3%	-4.6%
Belgium	96.8%	-4.1%
Bulgaria	16.2%	-3.2%
Croatia ¹⁵¹	40.0%	-5.3%
Cyprus	60.8%	-5.3%
Czech R.	38.5%	-4.7%
Denmark	43.6%	-2.7%
EMU-16 ¹⁵²	73.9%	-7.3%
Estonia	6.6%	0.1%
Finland	48.4%	-2.5%
France	81.7%	-7.0%
Germany	83.2%	-3.3%
Greece	142.8%	-10.5%
Hungary	80.2%	-4.2%
Ireland	96.2%	-32.4%
Italy	119.0%	-4.6%
Latvia	44.7%	-7.7%
Lithuania	38.2%	-7.1%
Luxembourg	18.4%	-1.7%
Malta	68.0%	-3.6%
Netherlands	62.7%	-5.4%
Poland	55.0%	-7.9%
Portugal	93.0%	-9.1%
Romania	30.8%	-6.4%
Slovakia	41.0%	-7.9%
Slovenia	38.0%	-5.6%
Spain	60.1%	-9.2%
Sweden	39.8%	0.0%
United Kingdom	80.0%	-10.4%

¹⁵⁰ Source: Eurostat Database

¹⁵¹ Data for Croatia is an estimate from the IMF World Economic Outlook Database.

¹⁵² Unweighted average of EMU-16 countries.

Appendix 2a: Business Cycle Correlation: Hodrick-Prescott de-trended coefficients

Country	Pre-Crisis: 1995Q1 - 2008Q1	Full Period: 1995Q1 - 2010Q4	Sub-period 1: 1995Q1 - 2004Q1	Sub-period 2: 2004Q2 - 2010Q4
Austria	0.8989	0.9232	0.8018	0.9712
Belgium	0.8731	0.9108	0.8604	0.9683
Bulgaria	0.4268	0.5381	0.1017	0.7627
Croatia	0.8144	0.8003	0.3861	0.8804
Cyprus	0.8121	0.7580	0.7878	0.7734
Czech R.	0.7450	0.8057	0.3505	0.9400
Denmark	0.7765	0.8459	0.6637	0.9096
EMU-16 ¹⁵³	0.8140	0.8272	0.6367	0.8959
Estonia	0.6129	0.7463	0.0060	0.9363
Finland	0.8870	0.9201	0.7405	0.9673
France	0.9408	0.9461	0.9393	0.9801
Germany	0.9596	0.9602	0.9301	0.9721
Greece	0.6385	0.4482	-0.0332	0.5362
Hungary	0.6827	0.8035	0.5361	0.8854
Ireland	0.8427	0.8613	0.7184	0.9051
Italy	0.9286	0.9474	0.8479	0.9805
Latvia	0.7094	0.7953	0.1497	0.9399
Lithuania	0.3974	0.6182	-0.4843	0.9218
Luxembourg	0.7825	0.8118	0.6992	0.9205
Malta	0.5812	0.6739	0.5166	0.7405
Netherlands	0.9270	0.9264	0.8969	0.9484
Poland	0.5594	0.5784	0.3443	0.8480
Portugal	0.7568	0.7911	0.7134	0.9118
Romania	0.7924	0.7092	0.7816	0.7355
Slovakia	0.4890	0.6253	-0.3336	0.8904
Slovenia	0.7529	0.8122	0.2071	0.9412
Spain	0.9527	0.9186	0.8952	0.9273
Sweden	0.8638	0.8696	0.7425	0.9048
United Kingdom	0.8840	0.9186	0.7524	0.9693

¹⁵³ Unweighted average of coefficients of EMU-16 countries.

Appendix 2b: Business Cycle Correlation: Christiano-Fitzgerald de-trended coefficients

Country	Pre-Crisis: 1995Q1 - 2008Q1	Full Period: 1995Q1 - 2010Q4	Sub-period 1: 1995Q1 - 2004Q1	Sub-period 2: 2004Q2 - 2010Q4
Austria	0.9299	0.9525	0.8658	0.9832
Belgium	0.8930	0.9270	0.8800	0.9812
Bulgaria	0.4408	0.6078	0.0553	0.7665
Croatia	0.8222	0.8320	0.3832	0.8973
Cyprus	0.8541	0.8146	0.8563	0.8251
Czech R.	0.8214	0.8757	0.6588	0.9815
Denmark	0.8839	0.9243	0.8197	0.9589
EMU-16 ¹⁵⁴	0.8484	0.8656	0.6636	0.9166
Estonia	0.7538	0.8433	0.3361	0.9779
Finland	0.9257	0.9444	0.8465	0.9739
France	0.9526	0.9584	0.9482	0.9864
Germany	0.9778	0.9767	0.9546	0.9863
Greece	0.4374	0.2686	-0.8450	0.4015
Hungary	0.8198	0.8860	0.6877	0.9517
Ireland	0.9574	0.9531	0.9232	0.9674
Italy	0.9645	0.9739	0.9172	0.9936
Latvia	0.8916	0.9226	0.6878	0.9834
Lithuania	0.5306	0.7205	-0.2351	0.9386
Luxembourg	0.8893	0.9203	0.8291	0.9749
Malta	0.6572	0.7805	0.6610	0.8156
Netherlands	0.9758	0.9751	0.9679	0.9786
Poland	0.6199	0.7203	0.4745	0.8919
Portugal	0.8757	0.9061	0.7639	0.9824
Romania	0.6472	0.6649	0.5288	0.6995
Slovakia	0.4871	0.6849	-0.4146	0.9191
Slovenia	0.8249	0.8678	0.5292	0.9465
Spain	0.9717	0.9457	0.9339	0.9494
Sweden	0.9113	0.9186	0.8221	0.9455
United Kingdom	0.9387	0.9576	0.8570	0.9887

¹⁵⁴ Unweighted average of coefficients of EMU-16 countries.

Appendix 2c: Contemporaneous and lagged correlation with euro area: HP filter

Country	Contemporaneous	1 Lag	2 Lags	3 Lags
Czech R.	0.8057	0.7159	0.5532	0.3832
Hungary	0.8035	0.7342	0.5459	0.3311
Croatia	0.8003	0.6643	0.4749	0.2809
Latvia	0.7953	0.7107	0.5672	0.3973
Estonia	0.7463	0.7094	0.579	0.4203
Romania	0.7092	0.4942	0.2202	-0.0152
Lithuania	0.6182	0.4763	0.2984	0.1163
Poland	0.5784	0.5917	0.4394	0.2795
Bulgaria	0.5381	0.3343	0.1287	-0.0066

Appendix 2d: Contemporaneous and lagged correlation with euro area: CF filter

Country	Contemporaneous	1 Lag	2 Lags	3 Lags
Czech R.	0.8757	0.7862	0.5942	0.3667
Hungary	0.8860	0.8185	0.6640	0.4725
Croatia	0.8320	0.6677	0.4155	0.1297
Latvia	0.9226	0.8302	0.6519	0.4243
Estonia	0.8433	0.8069	0.6751	0.4891
Romania	0.6649	0.4230	0.0953	-0.2235
Lithuania	0.7205	0.5680	0.3399	0.0905
Poland	0.7203	0.6794	0.5124	0.2928
Bulgaria	0.6078	0.3772	0.1095	-0.1351

Appendix 3a: Openness in CEECs and Euro Area

Country	2008	2009	2010	3-year Average
Austria	113%	97%	106%	105%
Belgium	171%	143%	160%	158%
Bulgaria	137%	104%	117%	119%
Cyprus	102%	86%	87%	91%
Czech R.	150%	133%	154%	145%
EMU-16¹⁵⁵	124%	109%	119%	117%
Estonia	147%	123%	150%	140%
Finland	90%	73%	79%	81%
France	56%	48%	53%	53%
Germany	89%	77%	87%	84%
Greece	60%	48%	50%	53%
Hungary	163%	150%	166%	159%
Ireland	158%	167%	186%	170%
Italy	58%	48%	55%	54%
Latvia	99%	89%	108%	99%
Lithuania	132%	111%	139%	127%
Luxembourg	324%	302%	318%	315%
Malta	173%	155%	169%	166%
Netherlands	144%	131%	148%	141%
Poland	84%	79%	84%	82%
Portugal	75%	63%	69%	69%
Romania	74%	68%	77%	73%
Slovakia	169%	142%	163%	158%
Slovenia	138%	115%	127%	127%
Spain	59%	49%	55%	54%

¹⁵⁵ Unweighted average of EMU-16 countries.

Appendix 3b: Trade Intensity with the Euro Area

Country	2008	2009	2010	3-year Average
Austria	52%	44%	51%	49%
Belgium	106%	89%	96%	97%
Bulgaria	45%	35%	40%	40%
Cyprus	36%	30%	32%	33%
Czech R.	81%	73%	85%	79%
Denmark	28%	24%	25%	26%
EMU-16¹⁵⁶	47%	39%	44%	43%
Estonia	44%	36%	42%	41%
Finland	24%	18%	20%	21%
France	26%	22%	24%	24%
Germany	32%	27%	30%	30%
Greece	16%	13%	13%	14%
Hungary	73%	64%	72%	70%
Ireland	31%	33%	36%	33%
Italy	21%	18%	20%	20%
Latvia	23%	18%	23%	21%
Lithuania	30%	25%	32%	29%
Luxembourg	78%	61%	64%	67%
Malta	73%	60%	64%	65%
Netherlands	67%	57%	66%	63%
Poland	39%	38%	40%	39%
Portugal	37%	33%	34%	35%
Romania	30%	29%	34%	31%
Slovakia	61%	52%	63%	59%
Slovenia	67%	54%	64%	62%
Spain	24%	19%	22%	22%
Sweden	32%	27%	28%	29%
United Kingdom	21%	19%	20%	20%

¹⁵⁶ Unweighted average of EMU-16 countries.